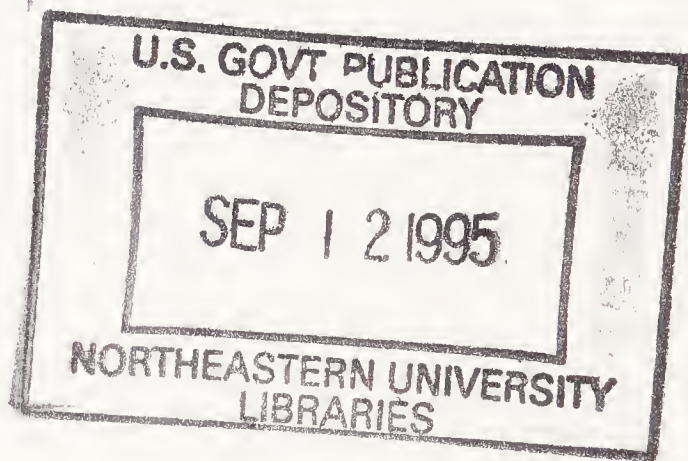


ANTARCTIC BIBLIOGRAPHY





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ANTARCTIC BIBLIOGRAPHY

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Introduction

This volume is the twenty-second in a continuing series of compilations presenting abstracts and indexes of current Antarctic literature published since 1962. A companion volume to the series, *Antarctic Bibliography; 1951–1961*, extends the coverage retrospectively.

The material has been compiled over a period of 12 months; the cut-off date for inclusion in this volume was December 1994. To provide current awareness, the abstracts have also been distributed as 12 monthly bulletins under the title *Current Antarctic Literature*. The bulletins are generated from a computerized database which is also used in producing this cumulated listing and the indexes.

The present volume contains abstracts numbered from 49,498 to 51,653; these first appeared in issues no. 257 through 268 of *Current Antarctic Literature*. The first five volumes each contained 2,000 abstracts. Thus, items 1-2,000 appeared in v. 1 (published in 1965), items 2,001-4,000 in v. 2 (1966), items 4,001-6,000 in v. 3 (1968), items 6,001-8,000 in v. 4 (1970), and items 8,001-10,000 in v. 5 (1971). Volume 6 (1973) contained items 10,001-12,244, v. 7 (1974) items 12,245-14,447, v. 8 (1976) items 14,448-16,899, v. 9 (1977) items 16,900-19,248, v. 10 (1979) items 19,249-21,721, v. 11 (1980) items 21,722-24,083, v. 12 (1982) items 24,084-26,452, v. 13 (1983) items 26,453-28,961, v. 14 (1985) items 28,962-31,756, v. 15 (1986) items 31,757-34,660, v. 16 (1988) items 34,661-37,522, v. 17 (1989) items 37,523-40,798, v. 18 (1990) items 40,799-42,875, v. 19 (1991) items 42,876-45,062, v. 20 (1993) items 45,063-47,376, and v. 21 (1994) items 47,377-49,497.

The material is arranged in sections representing thirteen subject categories (see table of contents). Items that apply to two or more categories are listed in one section only and cross-referenced at the end of the other pertinent sections. Because of this scheme of arrangement, some items dealing with the same subject (from different aspects) will be found in two different categories; e.g. some papers on marine sediments may be found in Section E (Geological Sciences), and others in J (Oceanography). Within each section, abstracts are arranged by accession number; the indexes are keyed to these numbers.

Foreign-language titles are given in English translation first, with the original title following in brackets. Transliteration of Cyrillic and romanization of oriental languages follow the Library of Congress systems. Some of the citations are followed by library call numbers, preceded by the library symbols commonly used in union catalogs.

As a rule, the abstracts are informative rather than descriptive, but no attempt is made to verify or critically evaluate the author's statements or conclusions. Author abstracts are either used unchanged or modified for the sake of brevity or conformity to guidelines adopted for this bibliography.

Four indexes are provided: (1) an author index that includes coauthors (anonymous journal articles are referred to under the journal name); (2) a subject index that occasionally extends to two levels of subheadings and contains cross-references; (3) a geographic index to names of places, stations, and geographic features as approved by the U.S. Board on Geographic Names; and (4) a grantee index to names of organizations or institutions that received financial support from the National Science Foundation for work that resulted in publications abstracted in the volume. In each index, entries are cited by a letter, indicating the subject category, followed by the accession number: for example, B-42469 refers to section B, Biological Sciences, item number 42469.

Although the majority of the publications abstracted are in the collections of the Library of Congress, many significant items were lent by or exchanged with other institutions, made available by the Office of Polar Programs of the National Science Foundation, or received as review copies or reprints directly from publishers and authors. Because they contribute to more current and complete coverage, review copies and reprints are especially valuable, and publishers and authors are encouraged to send them to the Library of Congress, Science and Technology Division, Cold Regions Bibliography Project, Washington, D.C. 20540-5582, U.S.A.

Requests for photoreproductions of documents cited in this bibliography, except material protected by copyright, should be directed to the Library of Congress, Photoduplication Service, Dept. C-177, 10 First Street SE, Washington, D.C. 20540. U.S. government or government-sponsored technical reports may, in most cases, be obtained from the National Technical Information Service, Springfield, VA 22151. For such reports, NTIS order numbers are usually included in the bibliographic citation.

Stuart G. Hibben, *Head*
Cold Regions Bibliography Project
Science and Technology Division
Library of Congress

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A. GENERAL

A-49501

Belgian Science Policy Office, **Belgian scientific research programme on the Antarctic. Phase 2 (1988-1992). Published papers**, Brussels, 1993, 9p., For scientific results of Phase One see 18A-40983.

Phase Two of the program, presented here, was designed as a coordinated set of ten multidisciplinary integrated research projects encompassing four areas: plankton ecology; marine biogeochemistry; marine geophysics; and glaciology and climatology. This document provides a complete list of the scientific papers resulting from the achievements of the ten research projects of Phase Two of the program (1988-92).

A-49503

Council of Managers of National Antarctic Programs, **Report to the XVII Antarctic Treaty Consultative Meeting**, Venice, 1992, 80p.

This report to the 17th ATCM by the Council of Managers of National Antarctic Programs (COMNAP) marks the end of its fourth year, and the year in which COMNAP was formally recognized as an important component of the Antarctic Treaty System. As shown by the contents of this report, the efforts of the national operators as a group have concentrated on science support and the range of topics dependent upon the management and conduct of operations and logistics in Antarctica. All of the members of COMNAP share primary concerns for safety and efficiency in their individual programs, but have increasingly taken a collective approach to develop methods for the implementation of measures for the protection of the antarctic environment and of other ATCM Recommendations.

A-49505

Victor, P.É., Victor, J.C., **Antarctic planet: man's new land** [Planète antarctique: nouvelle terre des hommes], Paris, Robert Laffont, S.A., 1992, 274p., In French. Refs. p.249-264.

The authors, father and son, review in the nine chapters of this book the history of antarctic discovery and exploration and their own experiences as polar explorers. They discuss Antarctica from a variety of points of view: environmental, economic, political, geographic, and climatological among others. Explanatory notes of the chronology, geography and science related to events touched upon in the book, are presented in several appendices. A full text of the Antarctic Treaty and a list of signatory states are also appended. Many photographs and maps are included.

A-49536

Liljequist, G.H., **High latitudes: a history of Swedish polar travels and research**, Stockholm, Swedish Polar Research Secretariat, 1993, 607p., Refs. p.585-595.

Of the 50 chapters of this book reviewing the history of Swedish polar expeditions, only two are dedicated to Antarctica. Chapter 34 covers the Swedish Antarctic Expedition of 1901-1903 under Otto Nordenskjöld, giving its historical background and describing relief expeditions and the type of research carried out. Also included in this chapter is a brief note on the planning of an Anglo-Swedish Antarctic Expedition for the years 1911-1914, and the subsequent dissolution of the plans. Chapter 44 covers the Norwegian-British-Swedish Antarctic Expedition of 1949-1952, describing its background and organization, the voyages of the icebreaker-sealer *Norsel* and the factory ship *Thorshövd* in the Scotia Sea, and the construction and research activities and wind speed data for 1950 and 1951 is included in this chapter. In addition, one page in ch. 45 summarizes the International Geophysical Year (1957-58) activities in the Antarctic.

A-49550

Antarctic Society of Australia, **Newsletter, No.34, Sep. 1993**, Pymble, New South Wales, 1993, 20p.

The news items presented in this issue deal with the following: the fear of British scientists that the ozone hole this year may be the deepest ever; comments on the IWC Report of the Workshop on Whale Killing Methods; a NASA study of wintering-over effects in man; women harassed on antarctic stations; the ecology of Marion I.; and a marine science cruise of the Australian icebreaker *Aurora* in 1993, reported by one of the participating researchers.

A-49551

Antarctic Society of Australia, **Newsletter, No.33, June 1993**, Pymble, New South Wales, 1993, 16p.

The news items presented in this issue deal with the following: a 1993 whale survey in antarctic waters south of Australia; new volcanic activity on Heard I. and the ongoing research there; highlights of the 1993 Fenner Conference on the Environment and some comments on the Australian conservation strategy in the Antarctic; the fate, and related glaciological observations, of 3 giant icebergs that broke off the Filchner Ice Shelf in 1986, one of which is headed to warmer waters and is beginning to melt; better protection for albatrosses, who drown in great numbers in southern waters when they get caught on bait hooks of fishing operators; and highlights of the 45th annual meeting of the International Whaling Commission held in Kyoto May 10-14, 1993.

A-49588

Cheng, S.H., et al, **Study of framework of prospective Chinese Antarctic Information System (CAIS)**, *Antarctic research (Chinese edition)*, 1993, 5(3), p.60-74, In Chinese with English summary. 43 refs.

This paper describes the architecture of the Chinese Antarctic Information System (CAIS) along the lines of concept-theory-method-application. It discusses the mutual supplementary relation between the establishment of CAIS and antarctic data management, describes models of conceptual structure and the framework of CAIS, analyzes CAIS' main structure and composition, and studies the hierarchical and correlational properties of the framework. Considering problems that may weaken CAIS, it suggests some needed techniques, research methods and basic principles and development strategies. It points out that the first objective of CAIS is to develop an Antarctic Scientific Data Directory and antarctic key words according to the international ADIF, and that the construction of CAIS must provide rapid access to antarctic data resources. It must reflect and develop synchronously with international dynamics, in order to make CAIS efficient, systematic, economical and reasonable. (Auth. mod.)

A-49611

Chang, S.K., Choe, M.Y., Kang, Y.C., **Activities of the 6th Korea Antarctic Research Program in 1992/93 austral summer (December 1992-March 1993)**, *Korean journal of polar research*, June 1993, 4(1), p.53-59, In Korean with English summary.

This report describes the activities of the 6th Korea Antarctic Research Program (KARP) from Dec. 1992 to Mar. 1993. Surveys focusing on geological and biological sciences and general oceanography were carried out in Bransfield Strait and in the waters off of King Sejong Station. R/V *Onnuri*, the ocean-going vessel operated by KORDI and equipped with state-of-the art instruments, was used for the first time in the Antarctic. (Auth.)

A-49626

South Africa. Weather Bureau, **Newsletter/Nuusbrief, No.533, August 1993**, 1993, 24p., Text and titles in Afrikaans or English.

South African research activities on Marion and Gough islands and at SANAE Station, along with general news items, are reported. Weather reports are presented, including ozone measurements, with tables and graphs for the month of Aug. 1993.

A-49627

South Africa. Weather Bureau, **Newsletter/Nuusbrief, No.532, July 1993**, 1993, 32p., Text and titles in Afrikaans or English.

South African research activities on Marion and Gough islands and at SANAE Station, along with general news items, are reported. Weather reports are presented, including ozone measurements, with tables and graphs for the month of July 1993.

A-49628

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari, Vol.8, No.9**, Sep. 1993, p.52-58, In Italian.

This issue contains the following news items concerning Antarctica: a planned expedition to the lava lake of Mount Erebus, by the French explorer J.L. Etienne, to study the composition of gases and solid matter emitted by the volcano; an article in English about the launching of 2 high-altitude helium balloons from a site near McMurdo Station, carrying instruments for probes of Mars and the Sun; the spectral irradiance of McMurdo Dry Valleys' lakes; a study on the antifreeze mechanics in polar fishes; and Australian plans to use the old ship *Kista Dan* as a polar museum in Melbourne harbor.

A-49633

Caschetto, S., ed, **Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992)**, Brussels, Belgian Science Policy Office, 1993, 3 vols., Refs. passim. For individual papers see B-49634, B-49638, E-49639, F-49640, F-49643 through F-49645, I-49642, J-49635 through J-49637 and J-49641.

The articles collected in these three volumes report results of investigations on plankton ecology and marine biogeochemistry, marine geophysics, and glaciology and climatology, respectively, carried out Oct. 1988-May 1992 in the framework of Phase Two of the Belgian scientific research program on the Antarctic. For reports of Phase One of the program see 18B-40984-40985; 18E-40987; 18F-40988, 40991-40992; 18I-40990; 18J-40986, 40989.

A-49652

1988/89 New Zealand antarctic research programme review, *New Zealand antarctic record*, 1989, 9(3), 45p.

This issue is devoted to short reports on the projects comprising the 1988-89 New Zealand antarctic research program. The reports are grouped by discipline, including biology, geodesy and geographic information, geology, ice and snow, ocean sciences, physical and atmospheric sciences, and solid earth geophysics. Short comments are made on a major restoration work at Cape Evans and on Ross I. historic huts. An author index, notices and a guide to authors conclude this issue.

A-49665

Antarctic Society of Australia, **Newsletter, No.35, Dec. 1993**, Pymble, New South Wales, 1993, 20p.

The news items presented in this issue deal with the following: the reconstruction of Australian antarctic stations; the cuts in the Australian budget for antarctic research; a British view of the future of scientific research in Antarctica; impact of changes in ocean circulation and nutrient availability; an update on issues associated with climate change and the antarctic ozone hole; safe navigation in antarctic waters; seabird mortality in longline fisheries around South Georgia; and plans to revamp McMurdo Station.

A-49686

Davey, F.J., **Project management**, Antarctic Stratigraphic Drilling, Cape Roberts Project, Workshop report. Royal Society of New Zealand, Misc. Ser. No.23, Wellington, New Zealand, 1992, p.32-38, 54 refs.

The draft plan outlined here for management of the Cape Roberts Project developed from discussions at the Planning Workshop. It will require further discussion and development. The Cape Roberts Project can be viewed as having two parts—science and logistics, and two phases—planning and drilling. Management of the project requires the coordination of resources from several national programs to fulfill an agreed program of activity. However it is considered essential for efficient operations

to have a single point of control in both scientific planning and logistics organization. The essential link in the proposed management structure is the International Steering Committee (ISC), a group of active senior scientists from the major nations involved in the project. In logistics a single national program should be responsible for operations in Antarctica, coordinating resources of all contributing national programs. The Planning Workshop proposed that the New Zealand Antarctic Program should take this role. In science operations planning should proceed through the ISC, but a science project leader should be nominated for coordinating science activity on the ice. This person would be responsible for liaising with the logistics support group, with the ISC on science concerns and for the day-to-day science operations in Antarctica. (Auth.)

A-49729

Sato, N., **34th Japanese Antarctic Research Expedition in 1992-1994**, *Polar news*, Mar. 1993, No.56, p.21-23, In Japanese.

Activities of the 34th Japanese Antarctic Research Expedition, consisting of a wintering party of 39 and a summer party of 16, scheduled for summer 1992-winter 1994, are summarized. A table is included listing the names, fields of interest, ages, and affiliations of the expedition members. Planned research activities include the Polar Patrol Balloon, ozone observations, and deep ice core drilling.

A-49733

Fukuchi, M., **Report of wintering team of JARE-33 in 1991-1993**, *Polar news*, Aug. 1993, No.57, p.23-28, In Japanese.

The activities of the wintering team, consisting of 36 members, of the 33rd Japanese Antarctic Research Expedition at Showa Station, Feb. 1992-Feb. 1993, are summarized. At first there were technical problems with the gravimeter for observations of the Earth's crust, and with the data acquisition from the fixed observation system on the ocean floor 5000 m deep for the study of sea ice biota, but subsequently the observations went more smoothly. Problems in treating the 48 tons of waste generated by the wintering team in a year are also discussed.

A-49734

Kamiyama, K., **Inland traverse of JARE-33 in 1992**, *Polar news*, Aug. 1993, No.57, p.29-32, In Japanese.

A trip by 7 members of the 33rd Japanese Antarctic Research Expedition to survey a site for deep core drilling in an ice dome about 1000 km inland from Showa Station is described. The team left Showa Station Sep. 2, 1992, arrived at the site Oct. 28, and returned to Showa Station Dec. 24.

A-49735

Yamauchi, H., **Experience of inland travel of JARE-33**, *Polar news*, Aug. 1993, No.57, p.33-37, In Japanese.

This is a personal account by one of the 7 men on the team of the 33rd Japanese Antarctic Research Expedition to survey a site, Sep.-Dec. 1992, for deep core drilling in an ice dome, designated Dome F, about 1000 km inland from Showa Station.

A-49736

Naruse, R., **Summer activities of JARE-34 in 1992-1993**, *Polar news*, Aug. 1993, No.57, p.44-46, In Japanese.

The summer activities, Dec. 1992-Mar. 1993, of the 34th Japanese Antarctic Research Expedition are summarized. Activities included global warming studies, Polar Patrol Balloon (PPB) observations of auroral X-rays and of the Earth's magnetic and electric field, and absolute gravity measurements.

A-49739

Sano, M., **Report of summer team of the 33rd JARE, 1991-92**, *Polar news*, Aug. 1992, No.55, p.9-14, In Japanese.

The summer activities, Dec. 1991-Mar. 1992, of the 33rd Japanese Antarctic Research Expedition are summarized. The 4-level, 3-story administration building at Showa Station, begun by the 32nd Expedition in the summer of 1990-91, was completed this summer period in Feb. 1992. The first story is constructed of concrete panels over a steel frame and the 2nd and 3rd stories are constructed of thermal insulating, aluminum-zinc-galvanized steel sheets over laminated wood panels. A floor plan is included and there is a photograph of the building on the back cover.

A-49741

Fujii, Y., **Report of wintering team of the 32nd JARE, 1990-92**, *Polar news*, Aug. 1992, No.55, p.32-37, In Japanese.

The activities of the wintering team at Showa Station, Dec. 1990-Jan. 1992 of the 32nd Japanese Antarctic Research Expedition are summarized. The wintering team consisted of 39 members. An indoor greenhouse unit was installed for inverted vegetable growing, "inverted," because the plants are placed on racks above and below a 20,000 lux fluorescent light and grow towards the light, apparently unaffected by gravity. A pink color observed in stratospheric clouds at an altitude of 18-25 km in July 1991 indicated a drastic increase in nitric acid aerosols. Temperatures at that same altitude and time were -85 C. A census of an Adélie penguin rookery at Langhovde in Nov. 1991 indicated a population decline of 50-65% from 1988 and 10% from 1990. From a sampling of 43 pairs that had been flipper banded the year before, only 8 returned as the same pair, indicating a divorce rate of 81%.

A-49742

Kanda, H., **Site of Special Scientific Interest, Antarctica**, *Polar news*, Aug. 1992, No.55, p.51-59, In Japanese.

The 14th Antarctic Treaty Consultative Meeting, Rio de Janeiro, Oct. 1987, under Recommendation XIV-5 designated Yukidori Valley in the Langhovde Hills on Lützow-Holm Bay, about 30 km south of Showa Station, as Site of Special Scientific Interest (SSSI) No.22, effective Dec. 31, 1992 to Dec. 31, 2003. Yukidori Valley is of interest as a site to study fell-field ecosystems, to monitor the effects of global change, and to keep free from human disturbance.

A-49758

Kock, K.H., **Fishing and conservation in southern waters**, *Polar record*, Jan. 1994, 30(172), p.3-22, Refs. p.19-22.

In the southern ocean, fishing for finfish began in 1969/70 and for krill in 1972/73. More than 3 million tonnes of finfish were harvested prior to 1992/93, most of the catch coming from around South Georgia and Iles Kerguelen. After 15 years of exploitation, most fish stocks were heavily depleted. The krill catch from the southern ocean has been 4.9 million tonnes to date. More than 90% of this catch has originated from the Atlantic sector. Most fish stocks had already been over-exploited before the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) came into force in 1982. Stringent conservation measures to halt the further decline of the stocks have been implemented only since 1989. There is evidence that some fish stocks have started to recover recently. CCAMLR has implemented a number of conservation measures to safeguard other components of the marine ecosystems from fishing. CCAMLR adopted a system of inspection in 1989/90 and a scheme of international scientific observation in 1992. There is a growing recognition in CCAMLR of the need for preventive measures in circumstances of biological uncertainty. The way forward is likely to be a single-species model for the krill fishery which needs to take implicit account of the demands of natural predators, particularly at small scales. By contrast with the 1970s and 1980s, when most fisheries were subsidized, economic considerations and market demands will be the primary determinants of the development of fishing in southern waters during the 1990s. (Auth. mod.)

A-49763

Scientific Committee on Antarctic Research, **SCAR bulletin no. 112, January 1994**, *Polar record*, Jan. 1994, 30(172), Council of Managers of National Programs (COMNAP) and Standing Committee on Antarctic Logistics and Operations (SCALOP) Report(s) of meeting(s), Christchurch, New Zealand, June 1993, p.75-82.

Meeting discussions of two SCAR groups are reported. The Council of Managers of National Antarctic Programmes (COMNAP) met in Christchurch, N.Z., 21-25 June 1993. At the same time and location, but separately, the Standing Committee on Antarctic Logistics and Operations (SCALOP) was also in session. Principal SCALOP discussion topics include oil spill prevention and response, air safety, the 1992 symposium on logistics and operations, information exchange, and alternative energy. The COMNAP focussed on oil spill contingency plans, tourism and non-

governmental activities in Antarctica, and administrative matters on liaison and relationships. Lists of stations, nations operating in Antarctica during the winter of 1993, and station location maps are included.

A-49772

Académie des sciences, Paris. Comité national français des recherches antarctiques, **Report No.34 to SCAR. Scientific activities from Apr. 1, 1991 to Mar. 31, 1992, and projected activities (Apr. 1, 1992 to Mar. 31, 1993)** [Rapport No.34 au comité scientifique pour la recherche antarctique. (S.C.A.R.). Activités scientifiques du 1er avril 1991 au 31 mars 1992 et prévues (1er avril 1992 au 31 mars 1993)], Paris, 1992, 81p., In French. Bibliography p.51-67.

DLC QC994.9.C65

This report provides the following information: the geographic and geomagnetic position of the Dumont d'Urville Station in Antarctica and those of the other 3 French stations on the subantarctic islands; a list of permanent observatories and brief descriptions and contact persons for programs conducted at the observatories and on the stations from Apr. 1991 to Mar. 1992, in atmospheric and earth sciences, biology, oceanography and engineering; and outlines of studies projected from Apr. 1992 to Mar. 1993 in the above fields. A list of names and addresses of participating scientists concludes the report.

A-49778

Martin, J., ed, Academy of Sciences of the Estonian SSR, **Limnological studies in Queen Maud Land (East Antarctica)**, Tallinn, Valgus, 1988, 87p., Refs. passim. For individual papers see B-49784, B-49785, E-49779, E-49781, F-49780, I-49782 and I-49783.

DLC QH84.2.L56

This volume consists of 7 reports of investigations carried out in East Antarctica on Lake Unter-See and the Schirmacher Ponds during the summer season of 1983-1984. Nine bathymetric maps of the lakes are presented, as are the results of hydro-optical and biological investigations. Depth soundings revealed Lake Unter-See to be one of the deepest bodies of water in Antarctica; other data show that the Schirmacher Ponds, when compared to other antarctic lakes, have the lowest water nutrient concentrations.

A-49841

Morandi, M.C., **Argentine antarctic gazetteer** [Nomenclador Antártico Argentino], *Armada Argentina. Servicio de Hidrografía Naval. Publicación*, 1993, H-920, 67p., In Spanish.

This gazetteer of the antarctic section which Argentina claims as its territory contains approximately 2,700 Spanish place names, followed by their coordinates (generally south of 60S and between 75-25W) and most of their English equivalents.

A-49854

McGreevy, M.W., **Virtual reality and planetary exploration**, Humans and machines in space: the vision, the challenge, the payoff. 29th Goddard Memorial Symposium. Proceedings. Edited by B. Johnson, G.L. May, and P. Korn, San Diego, CA, Univelt, Inc., 1992, p.93-115, 24 refs.

DLC TL873.G58

NASA-Ames is intensively developing virtual-reality (VR) capabilities that can extend and augment computer-generated and remote spatial environments. VR is envisioned not only as a basis for improving human/machine interactions involved in planetary exploration, but also as a medium for the more widespread sharing of the experience of exploration, thereby broadening the support base for the lunar and planetary exploration endeavors. Imagery representative of Mars is being gathered for VR presentation at such terrestrial sites as Antarctica's McMurdo Dry Valleys.

A-49855

Wilkniss, P.E., **U.S. antarctic and space programs, a useful alliance**, Humans and machines in space: the vision, the challenge, the payoff. 29th Goddard Memorial Symposium. Proceedings. Edited by B. Johnson, G.L. May, and P. Korn, San Diego, CA,

Univelt, Inc., 1992, p.117-121.

DLC TL873.G58

Antarctica has been called "Space on Earth" because the continent's extreme isolation, combined with extremely low temperatures, alternating cycles of light and dark, and the lack of any naturally occurring life support, simulates planetary conditions. For scientists, the polar regions, particularly the Antarctic, are "Earth's window to outer space." Originally, this term applied to the study of the aurora and other phenomena related to solar-terrestrial interactions. Today this concept has broadened considerably to include research on processes occurring near or on the Earth, such as the study of solar ultra-violet radiation and related processes resulting from the depletion of stratospheric ozone above Antarctica or the investigation of high-energy solar or galactic particles from sites in central Antarctica. The alliance between the antarctic and space science can be traced to 1957—the year that Sputnik was launched and modern science programs began during the International Geophysical Year. The National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA) have a long history of cooperative projects in the Antarctic. This collaboration ranges from the use of satellite-based technology for communications, research weather observations, and data acquisition to testing and calibrating equipment to be used aboard spacecraft. In Jan. 1991, the two agencies signed a Memorandum of Agreement that will extend this collaboration. (Auth.)

A-49883

Capdevila, R., Ageitos, J.M., **Restoration of the Swedish hut at Hope Bay** [Restauración de la choza sueca de Bahía Esperanza], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1993, No.417, 20p., In Spanish. 3 refs.

Efforts dealing with the reconstruction and preservation of a small hut, brought from Sweden by the Swedish Antarctic Expedition of 1901-1903 and used as living quarters on Snow Hill I., are described. The project is carried out in the framework of the MUSEOANTAR program as Argentina's participation in the preservation of antarctic historic patrimony.

A-49897

Yoshida, Y., ed, NIPR Symposium on Antarctic Geosciences, 12th, Tokyo, Oct. 13-14, 1992, **Proceedings of the NIPR Symposium on Antarctic Geosciences, No.6**, Tokyo, National Institute of Polar Research, 1993, 157p., Refs. passim. For individual papers see E-49903 through E-49909 and L-49898 through L-49902.

This volume consists of 12 full-length papers and 15 abstracts contributed from presentations at the 12th Symposium on Antarctic Geosciences. The papers are arranged in the order of solid earth geophysics, geology and geomorphology. Topics discussed in solid earth geophysics deal with icequakes, status reports of geophysical observations at Showa Station, and rock magnetism. Geological studies relate to petrology and mineralogy of metamorphic and plutonic rocks from East Antarctica. Geomorphological studies comprise discussions on crustal movement of inland mountains, and submarine topography and stratigraphy of antarctic shelf margins.

A-49930

Hall, C.M., McArthur, S., **Ecotourism in Antarctica and adjacent sub-antarctic islands: development, impacts, management and prospects for the future**, *Tourism management*, Apr. 1993, 14(2), p.117-122, Numerous refs.

This article discusses tourist activity in Antarctica and the sub-antarctic islands, and the development of an appropriate management regime for ecotourism on the continent. The article examines the current and potential impacts of tourism on Antarctica's environmental and cultural heritage and within the Australian Antarctic Territory in particular. It then provides an appraisal of the political context which is unique to the antarctic situation and which shapes the peculiar circumstances that surround antarctic ecotourism. The paper concludes with a discussion of the potential development of national and international mechanisms to manage tourism in a sustainable manner in Antarctica and the sub-antarctic islands. (Auth.)

A-49931

Enzenbacher, D.J., **Tourists in Antarctica: numbers and trends**,

Tourism management, Apr. 1993, 14(2), p.142-146, 18 refs. This paper is an edited version of a paper that was first published in *Polar record*, 28(164):17-22. It has been updated to include tourism statistics for the 1991-1992 season. For the original paper, see 20A-45553. The basic text, tables, figures, and abstract remain the same except for the noted updated material.

More than 45,000 tourists have visited the Antarctic since 1957; numbers per year are provided. A brief history of sea and airborne tourism in Antarctica reveals past and current trends. The formation of the International Association of Antarctica Tour Operators and its role in the self-regulated tourism industry in Antarctica are considered, together with the implications of recently promulgated Antarctic Treaty Recommendation XIV-13. The highest recorded single season presence occurred during the 1991-92 season when nearly 6,500 tourists visited the Antarctic Treaty Area, a number shown to exceed the combined number of scientists and support personnel from all national antarctic programs. The Antarctic Treaty System provides a suitable framework within which to develop measures to protect Antarctica from tourist activity. However, regulations developed must be based on hard data on the size and impact of the industry to be effectively implemented.

A-49932

Wettergreen, D., Thorpe, C., Whittaker, R., **Exploring Mount Erebus by walking robot**, *Robotics and autonomous systems*, Dec. 1993, 11(3-4), International Conference on Intelligent Autonomous Systems, Third, IAS-3, Pittsburgh, PA, USA, Feb. 1993, p.171-185, 12 refs.

Dante is a tethered walking robot capable of climbing steep slopes. In 1992 it was created at Carnegie Mellon University and deployed in Antarctica to explore an active volcano, Mount Erebus. The Dante project's robot science objectives were to demonstrate a real exploration mission, rough terrain locomotion, environmental survival, and self-sustained operation in the harsh antarctic climate. The volcano science objective was to study the unique convecting magma lake inside Mount Erebus' inner crater. The expedition demonstrated the advancing state-of-the-art in mobile robotics and the future potential of robotic explorers. This paper details the objectives, describes the Dante robot, overviews what happened on the expedition and discusses what did and didn't work. (Auth.)

A-49976

Jones, W.V., **Evolution of the NASA long-duration balloon program**, *Advances in space research*, Feb. 1994, 14(2), p.(2)191-(2)200, 8 refs.

The development of long-duration ballooning techniques to support flights of 1-2 ton payloads for periods up to 2 weeks, possibly even longer, offers a near-space scientific mission capability with an order of magnitude improvement over traditional balloon flights. This revolution in scientific research ballooning began with the solution of the manufacturing difficulties that plagued the program in the first half of the 1980s, and it has culminated in the early 1990s with three successive circumnavigations of the antarctic continent in 9- to 14-day flights. A complementary capability in the Northern Hemisphere, which would approximately double the number of flights that could be supported each year, is needed to accommodate the trend for conventional payloads to be modified, or developed, for long-duration flights. Plans are already underway to employ the order-of-magnitude increased flight time for support of multi-flight research programs that will produce results comparable to some space missions. An overview of the current status and near-term plans for ballooning is presented, along with a discussion of some major science initiatives that have been enabled. (Auth.)

A-50034

Japanese Society of Snow and Ice. Antarctic Climate Research (ACR) Planning Committee, **Reports on antarctic climate research (I)**, *Seppyo*, Sep. 1993, 55(3), p.221-228, In Japanese. 81 refs.

Antarctic climate research (ACR) by the Japanese Antarctic Research Expeditions from JARE-28, Nov. 1986-Mar. 1988 through JARE-32, Nov. 1990-Mar. 1992, is summarized and citations of reports on the results of the research are provided in English and Japanese. Topics include satellite observations of clouds, radiation budget, sea ice, ice sheet-atmosphere interaction, and precipitation.

A-50035

Japanese Society of Snow and Ice. Antarctic Climate Research (ACR) Planning Committee, **Reports on antarctic climate research (II)**, *Seppyo*, Dec. 1993, 55(4), p.361-369, In Japanese. 37 refs.

This is the second of two papers on antarctic climate research (ACR) by the Japanese Antarctic Research Expeditions, from JARE-28, Nov. 1986-Mar. 1988, through JARE-32, Nov. 1990-Mar. 1992. Topics include observations of the snow cover on the ice sheet; sastrugi; fluctuations in sea ice, especially along the coast; atmosphere-ice-ocean interactions; and automatic weather station observations.

A-50104

Pincheira, G., **Program for antarctic research and operations** [Programa de desarrollo de investigaciones y operaciones antárticas], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.531-533, In Spanish.

An outline is presented of activities, measures and inter-organizational cooperation needed to create an Antarctic Latin-American Program, including courses offered at the University of Chile as a basis for M.S. and Ph.D. work relating to Antarctica.

A-50119

Levack, I.D., McGowan, S.W., **Alexander Hepburne Macklin: physician, polar explorer, and pioneer**, *British medical journal*, Dec. 18-25, 1993, 307(6919), p.1597-1599, 16 refs.

A biographical outline of the medical officer of Shackleton's attempted Imperial Trans-Antarctic Expedition of 1914-1916, and an account of the fate of the expedition, considered a remarkable triumph of group survival, are presented.

A-50220

Macfarlane, S., ed, **Erebus Papers**, Auckland, Avon Press Ltd., 1991, 736p., Refs. passim.

DLC KUQ46.A57E73

The Erebus Papers tells the story of the investigations into the 1979 crash of AirNZ's DC10 on the slopes of Mt. Erebus and the court cases which followed. Edited extracts from the Erebus proceedings, and numerous illustrations of the evidence presented, are shown and commented upon. Three alleged main causes of the crash, including whiteout, are described. A reader's guide, consisting of 13 parts outlining 41 chapters, is attached to the book. Chapter 1, titled "Background", outlines the crash and the crew's estates' unsuccessful claim against the U.S. Government involving U.S. staff at McMurdo Station. Chapter 41, "Conclusions", summarizes and attempts to explain the alleged untruths presented in court.

A-50288

Bundesanstalt für Geowissenschaften und Rohstoffe. Federal Institute for Geosciences and Raw Materials, **Biennial report 1991/92** [Tätigkeitsbericht 1991/92], Hanover, Germany, 1993, p.109-113 and 147-154, In German and English. Selected pertinent publications.

Geoscientific work in the Antarctic (GANOVEX VI and VII), particularly in the area of the Ross Sea, is one of BGR's priority programs. The onshore (Victoria Land, Oates Coast, Marie Byrd Land) and offshore (Ross Sea) studies yielded new information about the plate tectonic history of the antarctic continent. To improve our knowledge of climatic changes on the earth, the beginnings and duration of the antarctic glaciation were studied. Investigations are being conducted within the scope of the international cooperation project "Lithospheric Investigations in the Ross Sea Area" (LIRA). A portion of the German research in Antarctica during this period included phytoplankton studies of southern ocean sediments, where thirteen biostratigraphic events were dated. Additionally, radiometric age determinations were made of the terranes of northern Victoria Land. The Shackleton Range was the site of further geochronological investigations using K-Ar and Rb-Sr methods at Watts Needle, Mount Wegener, and the Stephenson Bastion formations.

A-50296

Taylor, A.J.W., ed, **Human factors in polar psychology with some implications for space**, *SPRI polar symposia*, 1991, No. 1, 49p., For individual papers see H-50297 through H-50303.

DLC RC957.3.H85 1991

The volume comprises papers which were presented jointly as an invited symposium at the 24th International Congress of Psychology, in August 1988. The papers reflect the antarctic experience and viewpoints of research psychologists from the United States, Australia, France, Brazil, New Zealand and the polar experience and viewpoints of researchers from Canada and Norway. Primary emphasis lies in discovering the reactions of polar expeditioners to stress due to isolation, cold, and confined space, with a view toward applying the results to outer space environments.

A-50314

Bastmeijer, K., **Regulation of tourism in Antarctica** [Regulering van toerisme in Antarctica], *Circumpolar journal*, 1993, 8(3-4), p.13-33, In Dutch with English summary. 22 notes and refs.

The increasing number of tourists visiting Antarctica every year proves that a system to regulate future tourism in that area is necessary. Since tourism in Antarctica is not prohibited, it is necessary that, within the antarctic system, agreement be reached on how to protect the environment from adverse impacts of tourism. This paper presents an overview of the trends regarding antarctic tourism, the possible adverse effects of tourism and the relevant provisions of the antarctic system. An inventory is made of the possible elements of an adequate system as follows. All tourist activities must be subject to an environmental impact assessment. Structural provisions for tourists should be prohibited. Tourist activities should be limited to Antarctic Special Managed Areas (ASMA). A management plan with detailed regulations for tourist areas should be developed and approved by the ATCM. Strong efforts should be made to spread knowledge of the vulnerability of Antarctica and of the individual responsibility to protect the antarctic environment. Periodic assessments of the impact of tourist activities should be made. Regulations must be enforceable and enforced. Management measures must be financed by tourist activities. A system of liability for damage caused by tourist activities must be developed.

A-50318

Japan. Institute of Cetacean Research, **Japanese research on antarctic whale resources**, Tokyo, 1991, 16p., 6 refs.

DLC QL737.C424 J37 1991

In 1982, the International Whaling Commission decided to impose a moratorium on all commercial whaling. However, the Scientific Committee had made no recommendation to extend that moratorium to the plentiful Southern Hemisphere minke whale. The blanket moratorium was thus imposed without scientific justification. Since 1987, the Institute of Cetacean Research has been engaged in a program of scientific research to resolve the "uncertainty" which the IWC cited as its justification for imposing the moratorium. The primary objective of the research program is to estimate the age-specific natural mortality rate of the Southern minke whale through stochastic sampling carried out in combination with systematic sighting surveys. The program is also designed to ascertain stock size and the means of forecasting changes in that stock by studying other parameters including the recruitment rate and changes in reproductivity. A broader objective of the program is to elucidate the roles of whales in the antarctic marine ecosystem. This involves primarily the study of the food web, and in particular the prey-predator relationship between whales and their food sources of krill, fish and squid.

A-50390

U.S. Marine Mammal Commission, **Annual report to Congress, 1993**, Washington, D.C., 1994, 240p., Refs. p.225-240.

Background information and activities carried out by the Commission in 1993, regarding conservation and protection of marine mammals in the southern ocean, are described in Ch. 5 of this report, pages 137 to 145. The following is discussed: the Protocol on Environmental Protection to the Antarctic Treaty; activities related to marine living resources, including krill, finfish and crab fisheries; special regulation of new and developing fisheries; assessing and avoiding incidental mortality; ecosystem monitoring and the U.S. Antarctic Marine Living Resources Research Program.

A-50391

British Antarctic Survey, **Report for the period 1 April 1992 to 31 March 1993 (but reporting the full antarctic field season)**, Cambridge, Natural Environment Research Council, 116p., Pubs. p.93-106.

General remarks are made concerning staff changes and activities in various divisions at BAS stations; personnel awards are announced; distinguished visitors, and British and international meetings attended, are listed. Logistic and operational activities are reviewed, including ship and air operations. A science strategy plan is presented; 5 principal and 2 minor "Science Themes" provide a framework for 17 research programs which are reviewed in detail and consist of the following: pattern and change in the physical environment of Antarctica; geological evolution of West Antarctica; dynamics of antarctic terrestrial and freshwater ecosystems; structure and dynamics of the southern ocean ecosystem; physics of solar-terrestrial phenomena from Antarctica; humans in isolated polar communities; and antarctic geographic information and mapping. Included are 4 appendices providing BAS' financial background, and lists of 1992 publications and staff in various locations, divisions and ships.

A-50393

U.S. National Science Foundation, **United States Antarctic Program. Science Program Plan 1991-92**, [Washington, D.C., 1991], var. p.

This Science Program Plan contains a synopsis of each science project planned for the 1991-92 United States Antarctic Program (USAP). The USAP will support about 112 projects involving approximately 490 investigators and technicians. Of those 75% of the projects and personnel will transit through New Zealand and McMurdo Station (referred to as the Continental System). These can be further broken down as projects based out of McMurdo (including sea ice and Dry Valley work), Amundsen-Scott Station, and projects requiring dedicated LC-130 support to remote field camps. There are approximately 30 projects involving some 160 persons working at Palmer Station, in the Antarctic Peninsula, or on the R/V *Polar Duke* (referred to as the Peninsula System). The plan is generally descriptive and is meant as a summary of projects that have received support to do research in the Antarctic.

A-50403

Bacigalupi, L., ed, **Italian National Antarctic Research Programme: list of publications 1986-1992** [Programma Nazionale di Ricerche in Antartide: elenco delle pubblicazioni 1986-1992], Rome, ENEA-Progetto Antartide, 1992, 114p., Cover page and Introduction in Italian and English.

This list of the Italian National Antarctic Research Programme publications (ANT 92/14) is an updating to Sep. 1992 of a previous issue (ANT 90/08) published in July 1990. It comprises papers by authors whose research projects were carried out within the framework of the Italian program. The references are arranged by 10 subject areas. A new section, Political Geography, is introduced for papers relating to international law. An Appendix is provided listing all the Italian Antarctic Project (ENEA) internal reports as well as those edited by the Technical and Scientific Secretariat for Antarctica (CNR). An author index is included.

A-50464

Enzenbacher, D.J., **Antarctic tourism: an overview of 1992/93 season activity, recent developments, and emerging issues**, *Polar record*, Apr. 1994, 30(173), p.105-116, Refs. p.114-116.

Antarctic tourism is evolving at an ever-increasing pace. More than 7000 tourists, a record number, visited the Antarctic aboard cruise ships, yachts, and aircraft during the 1992-93 season. As annual tourists, tour operator, cruise and cruise ship totals increase, so do the number of landing sites used for tour visits. Although the antarctic tourism industry was once characterized by small expedition-sized vessels, 50% of antarctic cruise passengers travelled aboard ships with a capacity of 250 or more during the 1992-93 season. These developments present challenges to antarctic policy makers. There is growing awareness that environmental issues arising from antarctic tourist activity are increasingly important, but to date, comprehensive data on antarctic tourism are not available from a central source. This study compiles data from numerous sources in order to develop a clearer picture of the nature and scale of antarctic tourist activity. In an effort to present an overview of antarctic tourism, data from the

1992-93 season are considered along with important issues in the tourism debate, including significant trends and recent developments in the tourism industry, antarctic tourism research, tourist landings in Antarctica, industrial self-regulation, emerging issues, Antarctic Treaty negotiations on tourism, and national initiatives to improve dialogue between the industry and antarctic policy makers. (Auth. mod.)

A-50467

Scientific Committee on Antarctic Research, **SCAR bulletin No.113, April 1994**, *Polar record*, Apr. 1994, 30(173), Membership of SCAR and its Subsidiary Groups, p.160-161.

This issue contains changes and deletions to the lists in SCAR bulletin No.107, Oct. 1992, and SCAR bulletin No.109, Apr. 1993, concerning National Committees, Permanent Delegates, Alternate Delegates, and Permanent Working Groups. Also included is an Errata list for SCAR bulletin No.112, Jan. 1994, regarding stations of SCAR Nations operating in the Antarctic in the winter of 1993.

A-50483

Fiennes, R., **Mind over matter**, New York, Delacorte Press, 1994, 322p., 30 refs.

This book consists of 10 chapters describing the ordeals that the author and a companion, Dr. M.A. Stroud, endured on their journey, the first unsupported crossing of Antarctica, in 1992. Two appendices include notes on equipment and rations, discipline and leadership features, medical problems, physiological investigations regarding the effects of 3 months' sustained exercise with inadequate nutrition in an extremely cold environment, and a brief history of the formation and exploration of Antarctica.

A-50505

Müller, G.H, **Friedrich Ratzel's role in German south polar research and the expedition of 1902-1903** [Friedrich Ratzels Rolle in der Frage der deutschen Südpolarforschung und der Vorbereitung der deutschen Südpolar-Expedition (1902-1903)], *Polarforschung*, 1992 (Pub. 1993), 62(1), p.51-55, In German with English summary. Refs. p.54-55.

From those German geographers of the second half of the nineteenth century who actively engaged in promoting research for south polar regions and for an expedition to be sent there, the efforts and activities of Friedrich Ratzel (1844-1904) are presented. It is pointed out that many valuable details on particular questions may be gained through the evaluation of the correspondence left behind by the scientists concerned. (Auth.)

A-50516

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari, Vol.9, No.2**, Feb. 1994, p.7-12, In Italian.

This issue contains the following news items concerning Antarctica: an outline of the British research program for the 1993-1994 season, including the completion of an airfield structure at Rothera Station; highlights of the 5th Ecuadorian Antarctic Expedition; the postponement of the opening of the new runway at Dumont d'Urville Station and a review of the difficulties that caused it; the summarized results of a geochemical study of lakes in the vicinity of Davis Station; a comment on satellite data showing significant ice retreat in Bellingshausen Sea between mid 1988 and the beginning of 1991; the ecology of Weddell Sea fishes; and a note on the new Peruvian expedition leaving for Antarctica in Jan. 1993 with Argentine logistic support.

A-50517

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari, Vol.9, No.1**, Jan. 1994, p.1-6, In Italian.

This issue contains the following news items: brief notes on scientific research prospects in Antarctica, and the role the continent plays in the global atmospheric regime; a gradual decrease of ice cover thickness of Dry Valley lakes in the last 15 years; the increasing amount of ozone depletion, with losses equivalent to 2/3 of total ozone recorded at Halley Station, and forecast of ozone depletion reaching maximum values by the year 2000; some data on a new automatic geophysical observatory at Halley; a scientific explanation of the biological and mechanical factors accounting for green ice; a brief description of the mechanism inducing a cryptobiotic state in antarctic tardigrades and nematodes and its implica-

tions for space travel; a current project initiated by Dutch scientists and carried out at Davis Station for monitoring pollutants in the antarctic ecosystem; a commentary on volcanic tremors on Deception I. and how they correlate with seismic noise and the geological characteristics of the island, suggesting that the tremors are associated with geothermal noise originating in the uppermost ducts of the fumarolian system.

A-50518

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.8, No.12, Dec. 1993, p.73-78, In Italian.

This issue contains the following news items concerning Antarctica: some ecological features of the bottom ice algae; the British Antarctic Survey plans to close Faraday and Signy stations, or sustain restoration expenses of 5 million pounds for each station; a proposal for a European program for ice core drilling in Antarctica; some information on the Australian antarctic expeditions; a brief description of air ice water interaction; and periodical publications.

A-50519

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.8, No.11, Nov. 1993, p.66-72, In Italian.

This issue contains the following news items concerning Antarctica: the construction of a new South African station, SANAE 4 during the 1993-1994 expedition, at about 220 km from SANAE 3; the decreasing number of antarctic stations operating during winter, from 52 in 1990 to 46 in 1993; information on the function of ice cores as a source of paleoclimatological data; the recent discovery in Allan Hills of various fossil plants of different geological ages; and a review of the services of travel agencies, ships and airlines provided for antarctic tourists.

A-50520

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.8, No.10, Oct. 1993, p.59-65, In Italian.

This issue contains the following news items concerning Antarctica: a brief note on the USAP new director, Dr. Cornelius W. Sullivan; the function of Vostok ice cores as climatological archives; an outline of the plans to build a new town center at McMurdo; statistical data on the 6,500 tourists that visited Antarctica during the 1991-1992 season; and a list of scientific publications.

A-50521

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.9, No.3, Mar. 1994, p.13-18, In Italian.

This issue contains the following news items concerning Antarctica: a brief review of a 1993-1994 USAP project on the biological effects of ultraviolet radiation; a reprint of a short article from the Antarctic Journal of the United States on alternative energy sources, such as windmills, at McMurdo; an outline of the operational aspects of a meteorological center at McMurdo Station; a brief note on another USAP project: the study of Cenozoic volcanic rocks in Marie Byrd Land; and a note on the failed expedition to Mount Vaughan caused by an accident in Nov. 1993 involving a chartered plane at Patriot Hills.

A-50524

New Zealand. Ross Dependency Research Committee (RDRC), **Antarctic research: five year scientific research programme, 1993-1998. Priorities for the 1990s**, 1993, 26p.

An outline is presented of New Zealand's antarctic research strategy for the 1990s, including environmental research and comments on life, earth and physical sciences as the major area of current research and core competencies. Four priority themes for research emphasis are discussed: climate processes, human activities, biodiversity and terrestrial evolution. Future plans include the same four areas of research, and an outline of logistic requirements to carry it out. Three annexes listing New Zealand antarctic agencies, the functions of the Ross Dependency Research Committee, and allocation of funding for antarctic research conclude this report.

A-50600

National Research Council. Polar Research Board, **United States antarctic research report to the Scientific Committee on Ant-**

arctic Research (SCAR) No.33, 1991. Record of activities 1 April 1990-31 March 1991. Planned activities 1 April 1991-31 March 1992, Washington, D.C., National Academy Press, 1994, 98p., Bibliography of U.S. antarctic research publications from Apr. 1989 through Mar. 1990, p.63-90.

This report is prepared and distributed by the Polar Research Board, acting as the U.S. National Committee for SCAR, in response to SCAR's request. It contains information on the United States Antarctic Program and other U.S. research conducted in antarctic waters completed during the period Apr. 1990 through Mar. 1991 and planned for the period Apr. 1991 through Mar. 1992. The material is presented in 3 main sections: highlights of science activities; prospectus of planned activities; and future activities planned. A list of principal investigators and responsible authorities is included.

A-50601

Germany. Scientific Committee on Antarctic Research and International Arctic Science Committee, **German antarctic research report to SCAR No.15, 1993. 1. Past activities (October 1992-March 1993). 2. Planned activities (April 1993-March 1994)**, Bremerhaven, 1993, 80p., Refs. p.53-64.

Activities on 1 permanent and 6 summer stations, and on the research vessel RV *Polarstern*, conducted during the 1991-1992 season, are summarized under the following main headings: permanent observatories, regular observatories, and long-term monitoring; report on highlights of science activities from previous reporting period; prospectus of planned activities for coming reporting period; and future activities planned and funded. A list of principal investigators and responsible authorities is included.

A-50699

Hickam, H.H., Jr., **Study of the National Science Foundation's South Pole Station as an analogous data base for the logistical support of a Moon laboratory**, U.S. National Aeronautics and Space Administration. Technical memorandum, Oct. 1993, NASA-TM-108429, 47p., 11 refs.

It is the thrust of this report that the Amundsen-Scott Station of the National Science Foundation can be used to develop analogs for the construction, funding, and logistical support of a lunar base. Other analogs include transportation and national efforts versus international cooperation. A recommended lunar base using the Amundsen-Scott Station as a model is provided, as well as details concerning economical construction of the base over a 22-year period. (Auth. mod.)

A-50716

Gautier, N., Pavé, A., Rechenmann, F., **Object-centered representation and fish identification in Antarctica**, Advances in computer methods for systematic biology: artificial intelligence, databases, computer vision. Edited by R. Fortuner, Baltimore, MD, Johns Hopkins University Press, 1993, p.181-195.

DLC QH83.A38 1993

SHIRKA, a software program used for species identification, is described. Although still at the prototype stage, it is a complete development tool for knowledge-based systems. SHIRKA includes an inference engine, a scheme editor, a spreadsheet-like user interface allowing any operation on instances, an explanation module, and a truth maintenance module. However, the user interface is very primitive, using a line per line mode. In its present version, SHIRKA offers the essential characteristics of an object-centered knowledge base management system for identification of species that are known in a well-defined ecological environment. Implementation of a knowledge base a few kilobytes in size is not difficult. The Kerguelen fish knowledge base with 34 species and the knowledge base on tropical trees from the Ghat forest with about 300 species have been created on a Macintosh II. (Auth. mod.)

A-50749

Smith, V.L., **Sustainable antarctic: science and tourism**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.221-230, 8 refs.

This is an introduction to the special issue of *Annals of Tourism Research*, "Antarctic tourism", outlining the main points of interest of the different clusters of reports presented. General background, field research involving a range of tourism-related issues, governmental activities and policies toward tourism, and an ethnography of cruising are discussed.

A-50750

Splettstoesser, J., Folks, M.C., **Environmental guidelines for tourism in Antarctica**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.231-244, With French summary. 21 refs.

Commercial tourism in Antarctica began in the late 50s, and by mid-to late 80s, the tour operators were actively engaged in bringing tourists to the continent. Nearly 6,600 tourists visited Antarctica in the 1992-1993 austral summer, and nearly all by cruise ships. Recognizing the value and importance of the continent for scientific research, as well as a place to be shared and enjoyed by others, commercial tour operators formed the International Association of Antarctic Tour Operators (IAATO) in 1991. The 12 members (in 1993) pledged to abide by the U.S. Antarctic Conservation Act of 1978, and the succeeding Environmental Protocol of 1991, and to adhere to the industry-generated Antarctic Visitor and Tour Operator Guidelines. (Auth.)

A-50751

White, K.J., **Tourism and the antarctic economy**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.245-268, With French summary. 28 refs.

Tourism is the fastest growing portion of the antarctic economy. Historically, the antarctic economy was first based on early exploration, followed by the commercial development of the whale and seal industries. Since 1958 the largest part of the antarctic economy has been the production of scientific research. However, in the 1990s, for the first time the number of tourists is exceeding the number of scientists and support staff. This makes tourism the most important part of the antarctic economy when viewed in terms of number of people, although in dollar terms, the level of science and support expenditures is much higher. (Auth.)

A-50752

Headland, R.K., **Historical development of antarctic tourism**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.269-280, With French summary. 11 refs.

Although antarctic tourism has over a century of history, it became generally practicable during the last 25 years. Examples of early proposals demonstrate long established interest in the region. This paper gives a concise account of its development to the present circumstances, where commercial aviation has made access to the South Pole available for almost anyone desiring it. The numbers of visitors and their effects on the Antarctic have been items of concern; the calculation of person-days spent by tourists, compared with those of all others in the Antarctic, shows that less than 1% of human activity may be attributed to the industry. (Auth.)

A-50753

Hughes, J., **Antarctic historic sites. The tourism implications**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.281-294, With French summary. Refs. p.292-294.

Visits to historic huts are a major antarctic tourist attraction in the New Zealand Ross Sea Dependency area where four buildings have been "restored" as museums. Visitor expectations and attitudes are discussed and preservation problems relevant to tourist visits are identified. A preservation program for Mawson's Huts in the Australian Antarctic Territory is not yet resolved. Here damage by visitors is minor, compared with deterioration due to severe climatic conditions, but controversy over ice removal to allow entry into the huts as well as difficult access and finding problems delays conservation efforts. Increased visitor information and better guide training are needed, and preservation efforts should be extended to more recent International Geophysical Year sites. (Auth.)

A-50754

Acero, J.M., Aguirre, C.A., **Monitoring research plan for tourism in Antarctica**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.295-302, With French summary. 10 refs.

The Argentine Antarctic Institute and the Scott Polar Research Institute initiated joint research in 1991-92. The six-year project will monitor and evaluate touristic impacts on local biota, and provide data for appropriate tourism management. The research establishes control sites unaffected by human activity and examines sites under human pressure, both from scientific personnel and tourist presence. Tourism monitoring will record the numbers of tourists, their frequency of arrival, length of stay, and activities. This article reports preliminary data (1992-1993) from the Chinstrap penguin colony at Half Moon I. and the Adélie penguin rookery in Hope Bay on the Antarctic Peninsula. (Auth.)

A-50755

Enzenbacher, D.J., **Tourism at Faraday Station. An antarctic case study**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.303-317, With French summary. Refs. p.315-317.

Cruise ships and yachts have visited Faraday Station in Antarctica since 1968. A case study of tourism at this British research station identifies issues that challenge station management and policymakers. A summary table of visits made facilitates the discussion. The policy requires that cruise ships arrange station visits in advance and reconfirm before arrival; four visits are allowed each year. Faraday's relative inaccessibility helps to reduce visitor pressure to some extent. Tour operators, yacht owners, and station personnel have worked together to maximize visit benefits while minimizing disruptions to scientific research. The success of Faraday's strict tourism policy can be largely attributed to its consistency and to cooperation among all parties concerned. (Auth.)

A-50756

Cessford, G.R., Dingwall, P.R., **Tourism on New Zealand's sub-antarctic islands**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.318-332, With French summary. 22 refs.

Subantarctic islands managed as Nature Reserves by New Zealand are increasingly attractive tourism destinations. This requires regulation to ensure tourist needs are satisfied without environmental degradation. Data from a preliminary survey of shipborne tourists include demographic profiles, motivations and expectations, degree of visit satisfaction, values attached to the islands, and perceptions of impacts on the environment and wildlife. Comparison of responses before and after visits provides insight into issues of tourism management on these island reserves, and for planning and conducting tourist cruises at remote, environmentally sensitive destinations. Based on this preliminary survey, ways in which further surveys will be continued are discussed. (Auth.)

A-50757

Donachie, S.P., **Henryk Arctowski Station. Mixing science and tourism**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.333-343, With French summary. 7 refs.

The establishment of the Henryk Arctowski Station on King George I. in 1977 enabled Poland to commence year-round scientific research in Antarctica. The area has since gained the distinction of having the highest concentration of such facilities in Antarctica. The island has in turn become popular with tour operators. The introduction of larger tourist ships poses the danger that research programs and protected areas may be adversely affected. It is suggested that tour operators pay a fee for each client, and that the revenue be used to establish specific areas for tourists, or to coordinate their activities. (Auth.)

A-50758

Sanson, L., **Ecotourism case study in subantarctic islands**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.344-354, With French summary. 5 refs.

Tourism in New Zealand's subantarctic islands dates from 1968, but has expanded significantly since 1988. By 1994, a total of 3,090 people from ship-based tours have visited these nature reserves, which include some of the world's most isolated and vulnerable ecosystems. This article analyzes the development of government policy and management to ensure that protection of the natural conservation values remain paramount. The tour operators have assisted in funding the management of potential tourism impacts. A visitor monitoring program is operative to assess long-term impacts and expectations of visitor use. (Auth.)

A-50759

Hall, M., Wouters, M., **Managing nature tourism in the Subantarctic**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.355-374, With French summary. Refs. p.371-374.

Nature-based tourism in the antarctic and subantarctic regions has grown substantially in recent years. However, relatively few studies have examined tourism in the Subantarctic. This article discusses the growth and nature of tourist visitation in the Subantarctic and the development of management regimes for conserving the region's fragile nature and cultural heritage. Special reference is made to the Australian and New Zealand management strategies and the potential conflict between the objectives of government authorities and large and small operators in developing visitor guidelines. The article concludes by noting the significance of the development of subantarctic visitor management strategies for the concept of sustainable tourism. (Auth.)

A-50760

Beck, P.J., **Managing antarctic tourism. A front-burner issue**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.375-386, With French summary. Refs. p.384-386.

The growing number of tourists, in association with conservationist priorities, explain why managing antarctic tourism proves a prime contemporary concern of the Antarctic Treaty Parties (ATPs). Although a regulatory framework already exists, ATPs, guided by a range of interested nongovernmental organizations (NGOs) and tour operators, are examining existing weaknesses, alongside future needs. At the close of 1992, an informal meeting of ATPs and NGOs, though identifying possible ways forward, merely highlighted existing points of difference, even if the history of the Antarctic Treaty regime suggests that a consensus view should emerge in time. (Auth.)

A-50761

Bauer, T.G., **Future of commercial tourism in Antarctica**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.410-412, 4 refs.

This is a note on the author's doctoral research on past and current developments in antarctic tourism with the aim to identify the most likely scenarios of commercial tourism activities in the Antarctic Treaty area in 25 years time. The Delphi Method used in this study, which involves repeated surveying of a panel of experts, is described. Some preliminary results of the study are discussed.

A-50762

Enzenbacher, D.J., **NSF and antarctic tour operators meetings**, *Annals of tourism research. Special issue*, 1994, 21(2), Antarctic tourism. Edited by V.L. Smith and J. Splettstoesser, p.424-427.

The U.S. National Science Foundation (NSF) has held an annual open meeting with antarctic tour operators at its Washington D.C. headquarters since 1989. These meetings provide an important communication forum for tour operators conducting tourism in Antarctica (whether they are based in or market tours in the United States) and NSF, the agency responsible for overseeing the U.S. Antarctic Program (USAP). Each meeting establishes the schedule for tour ship visits at U.S. scientific research stations in the Antarctic for the coming season, including dates and numbers of visits allotted to ships, and relays important procedural information for visits. This report outlines agenda items and developments arising from the two most recently held meetings, July 8, 1992 and July 8, 1993.

A-50816

Orombelli, G., **Project Concordia, Terra Antartica**, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.231-232.

A formal agreement was signed in May 1993 in Rome by the French and Italian antarctic agencies for a scientific program to be developed at Dome C, which also implies the construction of a permanent station (Concordia Station). Outlines of 5 projects are presented, connected to the particular conditions at the Concordia Station location, covering glaciology, atmospheric sciences, astronomy and astrophysics, solid earth geophysics, and human biology and medicine.

A-50821

Hibben, S.G., **How the Cold Regions database covers polar oceanography**, Annual Conference of IAMSLIC, 19th, held Oct. 11-15, 1993, in Bethesda, MD, U.S.A. Edited by J.W. Markham and A.L. Duda, Fort Pierce, Florida, IAMSLIC, 1994, p.11-15.

The Cold Regions Bibliography (COLD) at the Library of Congress indexes current publications on science and technology in both polar regions. Since coverage includes the adjacent cold oceans, a substantial portion of the bibliography concerns marine topics. This paper reviews the coverage of oceanography in Antarctica as an example of a search methodology on one major topic. Discussion includes a statistical breakdown of sub-topics under oceanography, and illustrates other search methodologies. Current methods of accessing this information in COLD are briefly discussed. (Auth.)

A-50983

Wijkström, C., ed, Svärd, K., ed, **Swedish polar bibliography: a guide to Swedish literature on polar research 1945-1988 with supplement 1989-1992**, Stockholm, Swedish Polar Research Secretariat, 1993, 201p., Refs. p.9-136, 170-201. Titles in English or in Swedish with English translations. For preliminary edition covering 1945-1986/87 see 44-782 or 17A-40756.

Some 1400 citations from the Swedish literature on polar research for the years 1945-1988, plus about 350 more citations for the years 1989-1992 in a separate supplement, are listed. About 250 of the citations for the years 1945-1988, and about 200 for the years 1989-1992, are pertinent to the Antarctic. Research topics include humanities, geography, expeditions, social sciences, technology, natural sciences, geophysics, meteorology, oceanography, geology, glaciology, biological sciences, and medical sciences. An author and geographic index are included for the years 1945-1988.

A-50984

Andrews, M., ed, Brennan, A., ed, Kurppa, L., ed, **Polar and cold regions library resources, a directory. 3rd edition**, Boulder, University of Colorado, Institute of Arctic and Alpine Research, 1994, 208p., Sponsored by the Polar Libraries Colloquy.

Collections on polar and cold regions including Antarctica in libraries worldwide are briefly described based on answers to questionnaires. This directory lists 149 libraries with contact persons from 20 countries: Australia, Canada, Chile, China, Denmark, Finland, France, Germany, Greenland, Iceland, Italy, Japan, Netherlands, New Zealand, Norway, Russia, Sweden, Switzerland, United Kingdom, and the United States.

A-50989

Makarov, R.R., Men'shenina, L.L., Latogurskii, V.I., **Current assessment of the antarctic krill fishery**, *Polar geography and geology*, Jan.-Mar. 1994, 18(1), p.76-94, Refs. p.91-94.

The current situation regarding the main regions of the *Euphausia superba* fishery as well as seasonal variations in the fishery are discussed. The total annual catch (for all fishing countries), now totalling 300,000 metric tons, does not influence recruitment of the krill, nor does it have an impact on the feeding requirements of krill consumers. The lack of precise data on a number of parameters makes it necessary to approach rational fishery practices. In this connection, it seems reasonable to expand the areas of fishery activities, but to concentrate those activities in the area of the Antarctic Circumpolar Current. Ecological monitoring and monitoring

of the fishery are required. On this basis, models of the fishery and of stocks of *E. superba* may be developed in order to control the krill resources that are under stress. (Auth.)

A-50995

Swithinkbank, C., **Non-government aircraft in the Antarctic 1993/94**, *Polar record*, July 1994, 30(174), p.221.

Adventure Network International (ANI), a Canadian company with a sales office in Darien, CT, operated one Lockheed L-382G Hercules, two DHC-6 Twin Otters, and a Cessna 185 in support of private sector activities in Antarctica. This was the ninth consecutive season for ANI's air operations wing. The ANI camp at Patriot Hills blue icefield in the Heritage Range was reopened on Nov. 5, 1993. The second company operating in Antarctica this season was Allcarr, a cargo airline based in Laredo, TX. Allcarr used a DC-6B, but had the misfortune to crash on the first flight. The aircraft came down 9 miles from Patriot Hills on Nov. 26, 1993. The only other non-government activities were 9 flights operated by Aéroviás DAP of Punta Arenas to the Chilean station Teniente Rodolfo Marsh on King George I., using King Air and Twin Otter aircraft.

A-51003

South Africa. Weather Bureau, **Newsletter/Nuusbrief, No.534, Sep. 1993**, 1993, 32p., Text and titles in Afrikaans or English.

South African research activities on Marion and Gough islands and at SANAE Station, along with general news items, are reported. Weather reports are presented, including ozone measurements, with tables and graphs for the month of Sep. 1993.

A-51099

Meadows, J., ed, Mills, W., ed, King, H.G.R., ed, **Antarctic, World bibliographical series**, 1994, Vol.171, 383p.

The subject of this bibliography is the Antarctic, defined here as the region extending from latitude 60S to the South Pole at 90S. This includes the continent of Antarctica, its off-lying islands and the encircling southern ocean. The subantarctic islands, which lie mostly between 40 and 60S, are included because of their role in antarctic exploration and discovery and because their climate and natural history are so affected by the continent. The bibliography provides an annotated listing of books, atlases, journal articles, conference papers, serial titles and bibliographies, mainly in English. References have been selected to provide a broad introduction, covering such topics as geography and natural history, discovery and exploration, geopolitics, environmental management, economic resources and development, tourism, science policy and programs, logistics, engineering and construction, transport and communications, imaginative literature and the visual arts, and libraries, museums, archives and research institutions.

A-51117

Knott, D., **Falklands' hopes for oil development**, *Oil and gas journal*, July 18, 1994, 92(29), p.23.

This brief note outlines some of the national interests and possible diplomatic contacts between Argentina and Great Britain should Falkland Is. oil development prospects advance to the exploration and recovery levels.

A-51180

Brazil. National Committee on Antarctic Research, **National antarctic research report to SCAR No.05. Record of activities 1987/1988; planned activities 1988/1989**, Brasilia, 1988, 157p., Bibliography p.127-146.

The 6th Brazilian Expedition to Antarctica was undertaken in two phases. For the 1987/88 summer period, 3 ships, 3 refuges, and one antarctic station have provided logistical support for investigations in the South Shetland Is. area. In total, 29 research projects were carried out, involving approximately 150 scientists. The second phase of the expedition started in Mar. 1988, with the inauguration of the third overwintering party composed of 7 administrative and 4 scientific personnel. During 9 months, research activities in biochemistry and physiology of antarctic marine organisms, meteorology, and upper atmospheric physics were carried out at the Comandante Ferraz Station in cooperation with researchers from

Belgium and the Federal Republic of Germany. All field activities during the 1987-1988 austral summer, as well as those planned for the 7th Brazilian Expedition to Antarctica in 1988-1989, are described in this report.

A-51181

Royal Society of London. Antarctic Research Committee, **United Kingdom antarctic research 1993 report to SCAR, No.35. Apr. 1992-Sep. 1993: record of activities; Oct. 1993-Sep. 1994: planned activities**, London, The Royal Society, 1994, 69p., Bibliography p.49-69.

The British occupied and conducted research from Bird I., Signy, Faraday, Rothera, Halley, Damoy and Fossil Bluff stations during 1992 and 1993. Tables identify observatories, programs and principal investigators. The BAS science highlights include outlines of projects in biology, geology, solid earth geophysics, geodesy, cartography and geographic information systems, glaciology and oceanography, and physics and chemistry of the atmosphere. A prospectus of field activities planned for 1993/94 includes many of the same disciplines plus solar-terrestrial astrophysics and human biology and medicine.

A-51182

Norwegian Academy of Science and Letters. Norwegian National Committee on Polar Research, **Norway's antarctic research activities Oct. 1992-Sep. 1993; activities planned for Oct. 1993-Mar. 1994. Report No.34 to SCAR**, Oslo, 1993, 19p., Bibliography p.14.

Norway's antarctic research in 1992-1993 was conducted at Troll and Tor stations and on board the R/V *Lance* and on M/V *Polarbjørn*. Tables identify programs and their locations and principal investigators and their affiliations. Outlines of research projects are provided.

A-51183

Science Council of Japan. Japanese National Committee on Antarctic Research, **Japanese antarctic research report to SCAR. Apr. 1, 1992- Mar. 31, 1993: record of activities; Apr. 1, 1993-Mar. 31, 1994: planned activities**, Tokyo, 1993, 38p., Bibliography p.23-38.

The Japanese occupied and conducted research from Showa, Asuka and Mizuho stations, and aboard the *Shirase*, during 1992 and 1993. Tables identify permanent observatories, regular observations and long-term monitoring programs, and investigating organizations. Highlights of science activities for 1992-1993 include outlines of projects in biology, human biology and medicine, geodesy and geographic information, geology, solid earth geophysics, lower and upper atmosphere sciences, and glaciology. A prospectus of planned activities for 1993-1994 covers the same disciplines plus ocean physical sciences. Future activities planned are also listed.

A-51184

National Research Council. Polar Research Board, **United States antarctic research report to the Scientific Committee on Antarctic Research (SCAR) No.32, 1990. Record of activities 1 April 1989-31 March 1990. Planned activities 1 April 1990-31 March 1991**, Washington, D.C., National Academy Press, 1991, 97p., Bibliography of U.S. antarctic research publications from Apr. 1989 through Mar. 1990, p.62-89.

This report was prepared and distributed by the Polar Research Board, acting as the U.S. National Committee for SCAR, in response to SCAR's request. It contains information on the United States Antarctic Program and other U.S. research conducted in antarctic waters completed during the period Apr. 1989 through Mar. 1990 and planned for the period Apr. 1990 through Mar. 1991. The material is presented in 3 main sections: highlights of science activities; prospectus of planned activities 1 Apr. 1990-31 Mar. 1991; and future activities planned. A list of principal investigators and responsible authorities is included.

A-51210

South Africa. Weather Bureau, **Newsletter/Nuusbrief, No.535, Oct. 1993**, 1993, 32p., Text and titles in Afrikaans or English.

South African research activities on Marion and Gough islands and at SANAE Station, along with general news items, are reported. Weather reports are presented, including ozone measurements, with tables and graphs for the month of Oct. 1993.

A-51211

South Africa. Weather Bureau, *Newsletter/Nuusbrief*, No.536, Nov. 1993, 1993, 32p., Text and titles in Afrikaans or English.

South African research activities on Marion and Gough islands and at SANAE Station, along with general news items, are reported. Weather reports are presented, including ozone measurements, with tables and graphs for the month of Nov. 1993.

A-51212

South Africa. Weather Bureau, *Newsletter/Nuusbrief*, No.537, Dec.. 1993, 1993, 30p., Text and titles in Afrikaans or English.

South African research activities on Marion and Gough islands and at SANAE Station, along with general news items, are reported. Weather reports are presented, including ozone measurements, with tables and graphs for the month of Dec. 1993.

A-51213

South Africa. Weather Bureau, *Newsletter/Nuusbrief*, No.539, Feb. 1994, 1994, 24p., Text and titles in Afrikaans or English.

South African research activities on Marion and Gough islands and at SANAE Station, along with general news items, are reported. Weather reports are presented, including ozone measurements, with tables and graphs for the month of Feb. 1994.

A-51214

South Africa. Weather Bureau, *Newsletter/Nuusbrief*, No.540, Mar. 1994, 1994, 32p., Text and titles in Afrikaans or English.

South African research activities on Marion and Gough islands and at SANAE Station, along with general news items, are reported. Weather reports are presented, including ozone measurements, with tables and graphs for the month of Mar. 1994.

A-51236

Enomoto, H., *Wintering of JARE-34 (1992-1994): drilling at Dome F*, *Polar news*, Aug. 1994, No.59, p.18-22, In Japanese.

A trip by 9 members of the 34th Japanese Antarctic Research Expedition to the deep core drilling site at Dome F about 1000 km south of Showa Station is described. The team left Showa Station Oct. 21, 1993, arrived at the site Nov. 28, and returned to Showa Station Jan. 10, 1994. The site is on a snowfield at an elevation of 3800 m a.s.l. where the ice sheet is over 2000 m thick and should contain a record of over 100,000 years. The first trial core was obtained from 112 m.

A-51239

Watanabe, O., *35th Japanese Antarctic Research Expedition in 1993-1995*, *Polar news*, Mar. 1994, No.58, p.27-30, In Japanese.

Activities of the 35th Japanese Antarctic Research Expedition with 56 members (40 in the wintering team and 16 in the summer team), scheduled for Dec. 1993-Feb. 1995, are summarized. A table is included listing the names, fields of interest, ages, and affiliations of the expedition members. Planned research activities include studies on the sea ice biota, paleomagnetism, quaternary fluctuations in the ice sheet, ozone, and evidence of global change. The largest operation involves continuation of construction of facilities and transport of supplies for deep core drilling at the site designated Dome F (Fuji). The initiation of drilling is scheduled for the next Japanese expedition, the 36th.

A-51293

Higginson, I.N., *First antarctic voyage of Edgar Allan Poe*, *Polar record*, Oct. 1994, 30(175), p.287-298, 29 refs.

The Palmer-Pendleton sealing and exploring expedition (1829-1831) was the first American voyage of discovery to the Antarctic that had official government sanction. For the writer Edgar Allen Poe, this expedition was an important landmark in an age when science was beginning to change the American continent socially, politically, and geographically. This tale, written shortly after the return of the Palmer-Pendleton expedi-

tion embodies some of Poe's finest early writing. Interleaved with the critique of science are contemporary themes of discovery, and the Romantic preoccupation with man's relationship to nature. (Auth.)

A-51294

Capelotti, P.J., *United States Coast Guard and Borchgrevink's hut at Cape Adare, Antarctica, 1961*, *Polar record*, Oct. 1994, 30(175), p.311, 1 ref. For the Harrowfield account of Borchgrevink's hut and 25 other Ross Dependency historic sites see 17A-38386.

A brief account is given of the men of the US Coast Guard visiting the Borchgrevink Hut in 1961, and finding it in great need of repair, performing, unbeknownst to themselves, what today would be considered archeological site stabilization. The report derives from material found in the Coast Guard archives.

A-51396

Darling, M.N., et al, *National Science Foundation Young Scholars antarctic research experience: first science cruise of R/V Nathaniel B. Palmer (92-2)*, *Antarctic journal of the United States*, 1992, 27(5), p.328-329, 9 refs.

On June 22, 1992 five young scholars and four of their former high school teachers set foot on land in Punta Arenas, Chile after having spent a little over a month in the Weddell Sea aboard the research vessel *Nathaniel B. Palmer*. This was the final step in a process that began in the fall of 1990 when the students initially applied for the program after completing various Young Scholars programs (for high school students) across the country. Some details of the program, and activities of the participants, are discussed.

A-51425

Cervellati, R., ed, Marsico, B., ed, *Italy in Antarctica*, Rome, Italian National Antarctic Research Programme, PNRA, 1992, 35p., For Italian original see 20A-46997.

The text and numerous photographs of this booklet deal with the antarctic continent and Italian political and scientific involvement there, together with such aspects as landscape, geography, tectonics, physics, oceanography, climate and ecology of the region. A chronology of various antarctic expeditions and important events between 1557 and 1985 are included.

A-51454

Denman, D., *Privatise Antarctica*, *Economic affairs*, Oct./Nov. 1990, 11(1), p.27-29.

Analyzing the concept of turning Antarctica into a "wilderness continent", the author argues that the Convention on Antarctic Mineral Resources offers the best means of harmonizing the interests of mineral companies and conservationists alike.

A-51466

Mørkved, B., *Negotiating the mineral regime in the Antarctic: a review*, *International challenges*, 1992, 12(2), p.60-69, 1 ref.

This article analyzes some of the factors explaining changes in the institutional structure of the mineral regime during the complicated negotiation process leading to the Convention on the Regulation of Antarctic Mineral Resources Activities. This was a product of many compromises woven into a complex mechanism based on distribution of power among different bodies. The disagreements among the Consultative Parties on the mineral issue led to negotiations about comprehensive measures for the protection of the antarctic environment: the Protocol on Environmental Protection to the Antarctic Treaty, adopted in Madrid in Oct. 1991.

A-51478

Centro Ricerca e Documentazione Polare, Rome, *Polar news/Notizie polari*, Vol.9, No.4, Apr. 1994, p.19-24, In Italian.

This issue contains short comments on the dynamics of the west antarctic ice sheet; antarctic marine and terrestrial geology; the activities of the seismic network IRIS at Amundsen-Scott and Palmer stations; the joint logistic support among nordic countries in Antarctica; metal concentra-

tions in sediment samples obtained along a traverse of over 6,400 km; meteorites collected in the Queen Alexandra Range and Lewis Cliff areas; and life in the cracks of antarctic sea ice.

A-51479

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.9, No.5, May 1994, p.25-30, In Italian.

This issue contains the following news items concerning Antarctica: the GPS's (global positioning system) objectives and function in the polar region; an Australian study on the distribution, size and dissolution of icebergs; a meteorite of lunar origin collected in the Queen Alexandra Range; new immersion suits for New Zealand aircrew emergency landings in cold water; the fossil remains of a giant penguin found on Seymour I.; the plan to close the New Zealand station on Lake Vanda; and a replica of Shackleton's 1916 ocean voyage from Elephant I. to South Georgia.

A-51480

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.9, No.6, June 1994, p.31-36, In Italian.

This issue contains short comments on the establishment of greenhouses near antarctic stations to provide overwintering personnel with fresh vegetables; continuous plankton surveys in the Prydz Bay area; a study of paleocirculation and magnetism in antarctic and subantarctic submarine sediments; the monitoring of antarctic coastline dynamics; the psycho-physiology of stress in antarctic personnel; features of weather observations in antarctic conditions; hydrocarbon reserves on the continental shelf of the Falklands; and impact and management of feral animals on subantarctic islands.

A-51481

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.9, No.7-8, July-Aug. 1994, p.37-42, In Italian.

This issue contains the following news items concerning Antarctica: a brief review of ANTARES 2 oceanographic campaigns and plans for future research; the problems of tracking flying albatrosses, presented in an English article reproduced from ANARE News; lithospheric investigations in the Ross Sea area; and a short comment on the 23rd SCAR meeting in Rome.

A-51482

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.9, No.9, Sep. 1994, p.43-48, In Italian.

This issue contains the following news items concerning Antarctica: plans to reach the South Pole by a disabled Norwegian athlete, winner of 11 gold medals in paraolympic games; the fatal accident of a participant in the Norwegian expedition searching for the tent Amundsen raised at the South Pole in 1911; advances in transportation technology by a Japanese balloon project; and the reopening of the post office at Scott Base.

A-51483

Oerter, H., comp., **Filchner-Ronne Ice Shelf Programme. Report No.7**, Bremerhaven, Alfred Wegener Institute for Polar and Marine Research, 1994, 55p., Refs. passim. For individual papers see 49-1163 through 49-1173 or C-51484, C-51485, C-51490, F-51486 through F-51489, F-51491, F-51494, J-51492 and J-51493.

This report contains 11 written summaries of talks presented during the course of the Workshop. The meeting was held in the UK at Cambridge on June 10-11, 1993. A total of 31 participants attended from Germany, Norway, the United Kingdom and the USA. On the first day, talks on recent work were presented and on the second day national field plans of the future were discussed. Ocean-ice interactions and processes at the grounding line continue as the main topics for future research. There is still the need for deep hot water drillings to obtain measurements in the water column under the ice to prove or disprove theories about ocean circulation and the formation of marine ice under the ice shelf.

A-51501

Castellví, J., ed, **Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings** [Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la

Cruz, 20-25 de octubre de 1991], Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, 310p., In Spanish with English summary. Refs. passim. For individual papers see A-51515, A-51534, B-51506, B-51511 through B-51514, B-51516 through B-51530, H-51531 through H-51533, I-51502 through I-51505 and J-51507 through J-51510.

This is a collection of papers presented at the 4th symposium on Spanish antarctic activities, reporting results of investigations conducted by Spanish scientists during various antarctic expeditions, mostly in the vicinity of Juan Carlos I Station. The papers are representative of various fields of interest: oceanographic, atmospheric, climatological and, in particular, biological, including marine and medical sciences.

A-51534

Pincheira V., G., **Developing a program of antarctic research and operations** [Programa de desarrollo de investigaciones y operaciones Antárticas], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.301-304, In Spanish with English summary.

The University of Chile will conduct an academic program that considers educational activities and research projects in collaboration with national and international institutions devoted to pursue a better understanding of antarctic and subantarctic areas. Long range goals are: to train scientists, technicians and service personnel for support activities in the Antarctic; develop high level research projects designed to provide a better knowledge of the area between the southern tip of South America and the antarctic continent, with particular emphasis in the Antarctic Peninsula and the adjacent islands; and develop educational programs designed to make the international community aware of the need to conserve antarctic ecosystems and to protect them. (Auth.)

A-51551

Dalziell, J., Goldsworthy, L., **World Park Antarctica: does it have a future?**, *Forum for applied research and public policy*, Spring 1994, 9(1), p.73-75, 9 refs.

World Park Antarctica is an idea developed by an environmental coalition that promotes wilderness and wildlife protection in Antarctica, and maintenance of the continent as a zone of cooperative scientific activity and peace. The region is unique as a near-pristine scientific area for monitoring global pollution, lacking economic and social barriers to environmental protection. Recent interest in mineral development in Antarctica triggered concern about all future resource development schemes there, resulting in passage of the Protocol on Environmental Protection, which bans mining activities on the continent. Limitations of the Protocol are listed, including emphasis on national interests and lack of a compliance mechanism. Steps needed to create a world park in Antarctica are discussed.

A-51552

Carvalho, M.L., **Antarctic tourism must be managed, not eliminated**, *Forum for applied research and public policy*, Spring 1994, 9(1), p.76-79, 3 refs.

In view of the fact that tourism in Antarctica has increased steadily, served by commercial flights, cruise ships and private yachts, and that during the 1991-1992 summer season 6200 tourists visited Antarctica, compared with fewer than 2000 a decade earlier, it is suggested that tourism poses a serious risk to the fragile antarctic environment. The Antarctic Treaty's six recommendations to potential tourists are judged to be inadequate in view of the growing influx of visitors. The fact that several nations currently are conducting scientific studies on the impact of tourism in Antarctica, and the need for stricter controls to ensure responsibly conducted tourism, are discussed.

A-51553

Dingwall, P.R., **Madrid Protocol: Antarctic's protector**, *Forum for applied research and public policy*, Spring 1994, 9(1), p.80-82, 4 refs.

In 1991, Antarctic Treaty nations adopted the Protocol on Environmental Protection, called the Madrid Protocol, in response to calls for establishment of an antarctic world park, increasing concern about environmental damage, and rising interest in mineral resource exploitation. The World Conservation Union (IUCN) maintains that conservation should receive the same commitment under the treaty that cooperative scientific research projects enjoy. This commitment should encompass a mining ban, accountability to the protocol, and legal obligations to allow inspections and resolve liability issues. IUCN recommends establishment of a treaty secretariat for oversight, advisory committees to report on antarctic region activities, and public access to annual reports. IUCN also recommends that scientific research emphasize environmental impact monitoring and that pollution control guidelines be set for noise, oil spills, tourism, and other impacts.

A-51554

Rudbäck, G.T., **Proper protocol in Antarctica**, *Forum for applied research and public policy*, Spring 1994, 9(1), p.83-85, 1 ref.

The point is stressed that the Antarctic Treaty's Committee for Environmental Protection should assist nations in fulfilling their environmental obligations, particularly the environmental impact assessment process. It is regrettable that while nations are trying to improve their operations, conduct on the continent does not always live up to policy. It is suggested that it is time to move from ad hoc decision-making to comprehensive planning, with an emphasis on environmental impact assessments at the preliminary stages, to preserve the antarctic environment.

A-51555

Kriwoken, L.K., **Antarctic environment and joint protection**, *Forum for applied research and public policy*, Spring 1994, 9(1), p.86-88, 7 refs.

When all Antarctic Treaty nations ratify the Madrid Protocol, it will allow greater flexibility in addressing environmental protection issues in Antarctica. Proposed additions to the protocol would provide further protection to peripheral areas of special environmental significance, and require planning and coordination of all activities to avoid conflicts, improve cooperation, and minimize environmental impacts. Since expansion of research stations of several nations in this small area poses significant pollution threats, regional environmental planning is essential. Either the Scientific Committee on Antarctic Research, or a new committee for environmental protection, should oversee environmental planning and management.

A-51567

Ralston, K., **Man for Antarctica: the early life of Phillip Law**, Melbourne, Hyland House, 1993, 236p., Refs. p.226-230.

A biographical review of the Australian scientist Phillip Law is presented, from his birth in 1912, to his activities as ANARE officer in 1948, as Director of the Antarctic Division in 1952-1953, as antarctic explorer who established the Mawson Station in 1954, to his 80th birthday in 1992, when the Royal Society of Victoria held a symposium in his honor.

A-51568

Beeby, D., **In a crystal land: Canadian explorers in Antarctica**, Toronto, University Press, 1994, 262p., Notes and refs. p.227-249.

DLC G870.B34

The author reviews the history of the antarctic "golden era" of exploration, interlaced with stories based on unpublished diaries, journals, log-books, and letters, as well as published materials such as books, newspaper clippings, magazine and journal articles, and useful material on Canadian expedition members, some derived from interviews with three of the survivors.

A-51570

Burke, D., **Moments of terror: the story of antarctic aviation**, Kensington, New South Wales University Press, 1994, 320p, Bibliography p.296-297.

DLC TL532.B87

This is a story of aircraft, ships, and men who commanded them in their epic journeys through the antarctic skies and seas, and of the countries and organizations that supported them. The narrative begins with an

account of the 1902 balloon ascents of the first three aviators in Antarctica: Robert Falcon Scott, Ernest Shackleton, and Erich von Drygalski. It ends with the age of organized mass tourism, which came side by side with the amateur explorer-adventurer in Antarctica. Numerous photographs of famous explorers throughout this century, and their ships, accompany the text.

A-51573

Motoyoshi, Y., **Report on workshop "Earth Science Program in Western Enderby Land"**, *Antarctic record*, July 1994, 38(2), p.185-191, In Japanese with English summary. 1 ref.

The workshop "Earth Science Program in Western Enderby Land" was organized to discuss the future program of earth sciences in Enderby Land, entitled "Structure and Evolution of East Antarctica Lithosphere (SEAL Project)", which is proposed as part of the forthcoming 5-year scientific program of the Japanese Antarctic Research Expedition. This is a summary of the workshop, including an outline of the whole project, scientific significance in earth sciences, detailed objects of survey and observation, logistical problems, and domestic organization of research. (Auth.)

A-51599

New Zealand Antarctic Society, **Antarctic**, Vol.13, No.2, Christchurch, 1993, p.41-88.

Research activities and news items concerning New Zealand, Australia, Germany, Holland, South Africa, United Kingdom and the United States cover the following: details of the Council of Managers of National Antarctic Programmes international meeting, held in Christchurch; Australia's 1993-1994 summer Antarctic Programme, focusing on environmental protection; GANOVEX VII's operations in the Ross Sea in the summer of 1992-1993; the Dutch research program, which may be endangered by recession from 1994 onward; the construction of SANAE 4 in the 1993-1994 summer season; BAS 1992-1993 season review; the consequences at McMurdo Station of the severe storm which battered the area from June 3 to 8; and brief items concerning some of the subantarctic islands.

A-51600

New Zealand Antarctic Society, **Antarctic**, Vol.13, No.3, Christchurch, 1993, p.89-136.

Research activities and news items concerning New Zealand, Australia, Chile, Italy, Sweden, Finland, Norway and the United States cover the following: New Zealand's 1993-1994 ozone studies, seismological investigation and aerial mapping; the last Australian dogs to leave Antarctica; an outline of 19 projects of the 30th Chilean expedition; the international element of the Italian program of the 1993-1994 season; the continuation of the joint logistics agreement among the Nordic countries; outlines of the McMurdo Sound and Dry Valley programs of the United States in 1993-1994; and brief items on some of the subantarctic islands.

A-51601

New Zealand Antarctic Society, **Antarctic**, Vol.13, No.4, Christchurch, 1993, p.137-176.

Research activities and news items concerning New Zealand, Australia, Japan, Korea and the United States cover the following: the history of the founding of the New Zealand Antarctic Society and of its early activities; a reprint from ANARE News on an underwater vehicle (Tadpole) for oceanographic research; an outline of 23 programs of JARE-35; the 7th Korea Antarctic Research Programme, focusing on marine biology and geology; and the USAP Peninsula and shipboard programs for the 1993-1994 season.

A-51602

New Zealand Antarctic Society, **Antarctic**, Vol.13, No.6, Christchurch, 1994, p.225-276.

Research activities and news items concerning New Zealand, Australia, France, Germany, United Kingdom and the United States cover the following: a successful midwinter airdrop at Scott Base, winter ozone studies, and Vanda Station to be removed in the 1994-1995 season; a private contractor assuming the army role in Australian research program; details of the logistical operations associated with the French-Italian program to build a station at Dome C; data gathered during the 11th cruise of the R/V *Polarstern*; the rehabilitation of BAS dogs in their traditional

environment, an Inuit village on the northwestern shore of Hudson Bay; and details of USAP's construction at McMurdo over winter and its South Pole operations.

A-51603

New Zealand. Ministry of Foreign Affairs and Trade. NZAP, **New Zealand Antarctic Programme. 1994/95 events**, Christchurch, 1994, 32p.

The 1994-1995 New Zealand antarctic program will involve some 240 scientists, base support and field staff. In total, there will be 48 events undertaken with most of the scientific activity being conducted in and around Ross I., McMurdo Sound and the Dry Valleys. The research organizations involved in the program are listed, and more than 40 projects, covering many disciplines, are outlined.

A-51604

New Zealand. Ministry of Foreign Affairs and Trade. NZAP, **Antarctic operations manual**, Christchurch, 1994, 93p.

This manual is provided to assist all participants in the New Zealand Antarctic Programme with information on New Zealand's activities in Antarctica, and their individual role and responsibilities. The program's administration, operations and obligations specified in the Antarctic Treaty regarding conservation and protection of antarctic environment, historic monuments, tourism and international relations are discussed.

A-51605

New Zealand. Ministry of Foreign Affairs and Trade. NZAP, **Antarctic field manual**, Christchurch, 1994, 125p.

This manual is for guidance to antarctic field events, which are defined as parties leaving Scott Base by surface or air transport on a scheduled program for scientific, support, maintenance or recreational reasons. With the greatest emphasis on safety, the information contained in the manual is the result of many years of experience in Antarctica, covering field travel, flying, surface transport, field organization and camping, search and rescue, refuge huts, field communications, and clothing and equipment.

B. BIOLOGICAL SCIENCES

B-49502

Smith, R.L., Miller, L.G., Howes, B.L., **Geochemistry of methane in Lake Fryxell, an amictic, permanently ice-covered antarctic lake**, *Biogeochemistry*, 1993, 21(2), p.95-115, Refs. p.112-115.

The abundance and distribution of dissolved CH₄ were determined from 1987-1990 in Lake Fryxell, an amictic, permanently ice-covered lake in which solute movement is controlled by diffusion. CH₄ concentrations were low in the upper oxic waters, but increased below the oxycline. Sediment CH₄ was 1100 micromol/l in the 0-5 cm zone. There was no measurable CH₄ production in the water column. However, a significant CH₄ sink was evident in the anoxic, sulfate-containing zone of the water column (10-18 m). The water column CH₄ profile was modeled by coupling diffusive flux with a first order consumption term; the best-fit rate constant for anaerobic CH₄ consumption was 0.012/yr. On a total carbon basis, CH₄ consumption in the anoxic water column exerted a major effect on the flux of carbonaceous material from the underlying sediments, and serves to exemplify the importance of CH₄ to carbon cycling in Lake Fryxell. (Auth. mod.)

B-49504

Schminke, H.K., Dahms, H.U., **Life in the cracks of antarctic sea ice**, *German research: reports of the DFG*, 1993, No.1, p.9-11.

In the course of evolution organisms have displayed great flexibility in the ways they have adapted to life under extreme conditions. Even such an inhospitable biotope as the pack ice of the Antarctic has been colonized by small and very small organisms. A research team from Oldenburg has been investigating the evolution of the ice shrimp *Drescheriella glacialis*, which is a copepod and colonizes the channels and fissures in the antarctic sea ice. This ice shrimp was found on two voyages by the research vessel *Polarstern* in the pack ice of the Weddell Sea. The shrimp's habitat, evolution and population biology are discussed.

B-49507

Abyzov, S.S., et al, **Microorganism numbers in the deep layer of the central antarctic ice-sheet**, *Microbiology*, July 1993, 62(1), p.130-135, Translated from *Mikrobiologiya* 62(1):181-188, Jan./Feb. 1993. 20 refs.

Study of the deep layers of the central antarctic ice-sheet has revealed a constant and fairly rapid drift of microorganisms onto the surface of the continental ice-sheet. Examination by direct microscopy revealed much larger cell numbers than did a plating-out method. It appears that a large portion of the microorganisms either perished in the course of the prolonged encasement in the depths of the ice-sheet, or else they failed to grow on the nutrient media used in the study. Photographs of cells, obtained by scanning electron microscopy and luminescent microscopy, are presented. (Auth.)

B-49516

Chastel, C., et al, **Rickettsia-like organism from *Ixodes uriae* ticks collected on the Kerguelen Islands (French subantarctic territories)**, *Acta virologica*, Feb. 1993, 37(1), p.11-20, 13 refs.

A rickettsia-like microorganism was isolated in suckling mice from ticks collected from penguins breeding on Mayes I., Kerguelen Archipelago. At isolation, this agent mimicked a tick-borne arbovirus. Finally, electron microscopy studies of infected suckling mouse livers showed the presence of inclusions filled with pleomorphic microorganisms in the cytoplasm of some hepatocytes, sometimes dividing by binary fission and thus of obviously non-viral nature. No firm serological relationship was demonstrated with *Chlamydia psittaci*, *C. trachomatis*, *C. pneumoniae*, *Coxiella burnetti*, *Cowdria ruminantium*, *Ehrlichia canis*, *E. phagocytophila*, *E. risticii* or the WSU/1044 agent. The exact taxonomic position of the "Mayes" agent remains to be clarified. (Auth.)

B-49517

Saborowski, R., et al, **Soluble, dye-labelled chitin derivative adapted for the assay of krill chitinase**, *Comparative biochemistry and physiology*, July-Aug. 1993, 105B(3/4), p.673-678, 18 refs.

Carboxymethyl-Chitin-Remazol Brilliant Violet (CM-Chitin-RBV) was used for a colorimetric assay of chitinase activity in antarctic krill. Comparison with a reductimetric method by end-product detection was carried out by measuring FPLC elution profiles of krill crude extracts with both assays. Both profiles matched significantly. Krill chitinase was highly specific to CM-Chitin-RBV. The assay was characterized by easy handling and a very high sensitivity compared to that of end-product detection. Hydrolysis of CM-Chitin-RBV by N-acetyl-beta-D-glucosaminidase, beta-glucosidase, beta-galactosidase and N-acetylmuraminidase was negligible. The enzyme characteristics of chitinase from antarctic krill using CM-Chitin-RBV were: pH(opt)=7.5, T(opt)=50-55 C, Ea=52.1 kJ/mole, Km=0.07 +/- 0.01 mg/ml. (Auth.)

B-49519

Casaux, R.J., Barrera-Oro, E.R., **Diet of the blue-eyed shag, *Phalacrocorax atriceps bransfieldensis* feeding in the Bransfield Strait**, *Antarctic science*, Dec. 1993, 5(4), p.335-338, 32 refs.

The diet of the antarctic blue-eyed shag *Phalacrocorax atriceps bransfieldensis* was analyzed based on the identification of prey items in 50 regurgitated casts collected at Duthoit Point, Nelson I., in Feb. 1991. Fish remains occurred in 100% of the casts and represented 68% by number and 90% by weight of the total prey items. From a total of 2112 otoliths found, 1176 fish specimens were identified belonging to four demersal-benthic species: *Harpagifer antarcticus*, *Notothenia neglecta*, *Nototheniops nudifrons* and *Trematomus newnesi*. Equations to estimate total length and weight from otolith length are provided. *H. antarcticus* and *N. neglecta* were the most frequent (92%) and important by weight (66%) respectively. Cephalopod beaks found indicate benthic octopods as the second group in importance after fish. Other invertebrates such as polychaetes, gastropods, bivalves and crustaceans were only occasional. The presence of algae and stones in the casts is attributed to accidental ingestion. The results are in general agreement with those published for other antarctic localities which indicate that *P. atriceps* is a benthic coastal feeder, with fish as its main food. (Auth.)

B-49520

Jones, V.J., Juggins, S., Ellis-Evans, J.C., **Relationship between water chemistry and surface sediment diatom assemblages in maritime antarctic lakes**, *Antarctic science*, Dec. 1993, 5(4), p.339-348, Refs. p.346-348.

Maritime antarctic freshwater lakes and their catchments are inherently simple systems in an environment which is characterized by strong seasonality. Such lakes offer excellent opportunities to study the interaction of water chemistry and plant communities. The response of diatom species to environmental gradients was assessed by constructing a diatom and water chemistry dataset from 59 lakes at two locations (Livingston I., South Shetland Is. and Signy I., South Orkney Is.). Results indicate that diatom species abundance is predominantly related to nutrient and salinity gradients. The dataset will be used to create transfer functions which can be applied to sediment core diatom assemblages to reconstruct historical patterns of lake chemistry. (Auth.)

B-49521

Klages, M., **Distribution, reproduction and population dynamics of the antarctic gammaridean amphipod *Eusirus perdentatus* Chevreux, 1912 (Crustacea)**, *Antarctic science*, Dec. 1993, 5(4), p.349-359, Refs. p.358-359.

The geographic distribution and depth zonation of *Eusirus perdentatus* Chevreux, 1912 in the eastern Weddell Sea and adjacent Lazarev Sea are described. A total of 963 individuals of this carnivorous predator,

caught during 6 successive cruises at 71 stations between 176 and 799 m water depth, were used. Individuals of *E. perdentatus* have been kept alive for nearly 5 months in the laboratory. During this period females released 53 juveniles in Apr. Oocytes and embryos of females have been counted and measured. The duration of embryonic development in *E. perdentatus* was estimated at c. 12 months, using an empirical relationship based on the mean diameter of 4390 fertilized eggs. There is strong evidence that this species is semelparous, with hatching of juveniles at the end of austral summer. Two methods, herein termed as Year Class Model and Moulting Class Model, have been applied in order to describe the growth of females by means of cumulative length-frequency data. (Auth.)

B-49522

Roberts, N.J., Burton, H.R., Pitson, G.A., **Volatile organic compounds from Organic Lake, an antarctic hypersaline, meromitic lake, *Antarctic science***, Dec. 1993, 5(4), p.361-366, Refs. p.365-366.

Five volatile organic compounds were identified throughout 1991 in the hypolimnion of Organic Lake. These were dimethylsulphide (DMS), dimethyldisulphide (DM2S), dimethyltrisulphide (DM3S), dimethyltetrasulphide (DM4S) and phenol. The concentration of these compounds increased with lake depth. The concentration of DMS and DM2S was higher in the sediment than in the water column. Carbon disulphide occurred only in the sediment. DMS was the only volatile organic compound detected in the epilimnion of the lake, where its concentration increased from winter onwards. The source of DMS was not dimethylsulphoniopropionate (DMSP). This was determined by hydroxylation of the sample with NaOH. There was no change in the concentration of DMS, but the concentration of DM2S increased dramatically while the concentrations of DM3S and DM4S decreased concomitantly. This has important implications in the estimation of DMS derived from DMSP by hydroxylation when organic polysulphides are also present. The stability of the hypolimnion of Organic Lake was reflected by the lack of change in temperature, density, redox potential and the relatively constant concentration of volatile organic compounds throughout the year. Potential sources of the volatile organic compounds are discussed in relation to the isolated nature of the lake. (Auth.)

B-49524

Nigro, M., **Nearshore population characteristics of the circumpolar antarctic scallop *Adamussium colbecki* (Smith, 1902) at Terra Nova Bay (Ross Sea), *Antarctic science***, Dec. 1993, 5(4), p.377-378, 13 refs.

The scallop *Adamussium colbecki* is one of the dominant members of the nearshore benthic community around Antarctica. Due to its circumpolar distribution *A. colbecki* could be profitably used as a bioindicator for interpreting environmental variability and provide a useful focus for coordinating and comparing research among countries involved in antarctic marine biological research. In the present study, the distribution, density and size structure of a population of *A. colbecki* have been investigated by scuba diving at Terra Nova Bay in the northwest Ross Sea during the summer of 1991-92. The absence of scallops above 12-15 m and the trend of increasing density with depth, observed at Terra Nova Bay, might be due to local physical phenomena, such as wave exposure and/or the nature of the substrate, rather than to a local heterogeneity in trophic resources. (Auth. mod.)

B-49540

Blechs Schmidt, K., et al, **Investigations on the molecular systematics of skuas (Stercorariidae) [Untersuchungen zur molekularen Systematik der Raubmöwen (Stercorariidae)], *Zoologische Jahrbucher. Systematik Ökologie***, 1993, 120(4), p.379-387, In German with English summary. Refs. p.385-387.

After amplification of the mitochondrial cytochrome b gene by polymerase chain reaction (PCR), the authors directly sequenced 964 base pairs of this gene from all species and subspecies of the Stercorariidae, except for *Stercorarius longicaudus pallescens*. Reconstruction of a hypothetical phylogenetic tree with the maximum parsimony method revealed that the species of the *Catharacta* group and *Stercorarius pomarinus* are more similar to each other than any of them to *Stercorarius parasiticus* and *Stercorarius longicaudus*. The sequences of *cyt b* differ only slightly between *S. pomarinus* and *Catharacta skua skua*. Since both dif-

fer in biology and morphology, the genetic similarity of the mitochondrial *cyt b* gene could reflect a hybridization between both species in the past. In pairwise comparisons of investigated skuas, average percent nucleotide differences varied from 0.3% to 11.6%. The systematics of Stercorariidae need to be revised in the light of these data. In particular, given their poor differentiation and frequent hybridization, it is possible that all large Southern Hemisphere skuas belong to a single species. (Auth.)

B-49541

Peter, H.U., Kaiser, M., Gebauer, A., **Breeding ecology of the southern Giant petrels *Macronectes giganteus* on King George Island (South Shetland Islands, Antarctic), *Zoologische Jahrbucher. Systematik Ökologie***, 1991, 118(3/4), p.465-477, 26 refs.

The breeding ecology of *Macronectes giganteus* shows some peculiarities in dependence on the extreme antarctic conditions. The long breeding cycle is synchronized in the colonies in adaptation to the bad weather conditions during the laying and fledging period. The breeding regime of older breeding birds, which build bigger nests and prefer the centers of dense colonies, seems to be more synchronous than those of younger breeding birds. The breeding success of young inexperienced breeders is reduced. Male chicks, which have a longer nestling period than the smaller females, hatched significantly earlier than female chicks. The anthropogenic impact (increasing number of stations and scientific investigations) have reduced the breeding success and the number of breeding pairs of *M. giganteus*. (Auth.)

B-49553

Cherepanova, V., Neshumova, T., Elsner, R., **Muscle blood flow in diving mammals, *Comparative biochemistry and physiology***, Sep. 1993, 106A(1), p.1-6, Refs. p.5-6.

Skeletal muscle represents roughly one-half of the lean body mass of terrestrial mammals, and it very likely occupies a similar fractional relationship in marine mammals. Bryden and Felts (1974) have estimated that locomotory muscle of Weddell seals (*Leptonychotes weddelli*) comprises about 10% of the total body mass. Its considerable range of metabolic activity, from quiet rest to maximum exercise, is supported by a highly variable blood perfusion. In terrestrial mammals, an increase in oxygen consumption by the organs and tissues is satisfied by an increase in blood flow from rest to the maximum value of about 30-fold. This variability in blood flow is governed by three basic mechanisms: local, neural and humoral regulations. Metabolic activity results in the production and diffusion of substances that directly affect the vascular smooth muscle tone within the walls of small arteries and arterioles, thus influencing the blood flow by constriction or relaxation. The autonomic nervous system exercises regulation through innervation of the vascular smooth muscle, chiefly that of small arteries and arterioles. Regulation of blood flow during a breathholding dive by an aquatic mammal serves the conflicting functions of oxygen conservation and consumption. The physiology of the act of diving in seals is reviewed. (Auth.)

B-49555

Möller, C., Gams, W., **Two new hyphomycetes isolated from antarctic lichens, *Mycotaxon***, July-Sep. 1993, Vol.48, p.441-450, 30 refs.

Two new species of hyphomycetes, *Chaunopycnis ovalispora* and *Acremonium psychrophilum* were isolated from lichens in Antarctica. Isolations were made during the cruise ANT X/1b of the German research icebreaker *Polarstern* to the Antarctic Peninsula in the austral summer season 1991-1992. (Auth. mod.)

B-49558

Smith, V.R., Steenkamp, M., French, D.D., **Soil decomposition potential in relation to environmental factors on Marion Island (sub-antarctic), *Soil biology and biochemistry***, Nov. 1993, 25(11), p.1619-1633, 42 refs.

Decomposition potentials in Marion I. soils, as measured by the loss of tensile strength of buried cotton strips, lie at or near the upper extremes of the range found in tundras and related ecosystems. These high decomposition rates are related partly to the relative warmth of Marion I. and absence of very cold winters, but also, especially in the more active sites, to high soil nutrient contents and near-optimal moisture. Variation in TSL (tensile strength loss) between sites was attributed to particular soil vari-

ables. Multiple regression analysis showed soil moisture and fertility to be the most significant of these, with temperature apparently not important in distinguishing between sites. However, the absence of a warm summer probably retards decomposition at some sites. The two strongest vectors, yielded by principal components analysis of a range of soil physical, chemical and microbiological variables, together accounted for a significant proportion of TSL variation across sites. These vectors represented gradients from organic, eutrophic to mineral, oligotrophic soils, and from warm, wet to cold, dry soils. Trends are similar to those found in previous analyses of a wider range of edaphic and botanical variables for the island, the sub-antarctic as a whole, and also in bipolar comparisons. (Auth. mod.)

B-49559

Shears, M.A., et al, **Distribution of type III antifreeze proteins in the Zoarcoidei**, *Molecular and marine biology and biotechnology*, Mar./Apr. 1993, 2(2), p.104-111, 26 refs.

The antifreeze proteins present in four zoarcid species, each representative of different families of Zoarcoidei, were purified by a combination of gel filtration and reverse-phase high-performance liquid chromatography (HPLC). On the basis of molecular weights and amino acid compositions, they are typically the type III antifreeze proteins previously characterized from the ocean pout (*Macrozoarces americanus*). Each antifreeze protein is made up of several independently active components that show minor differences in amino acid composition and retention on reverse-phase HPLC. The antifreeze proteins appear to be encoded by large multigene families. Their distribution in different families of the Zoarcoidei is consistent with the hypothesis that climatic stress from the Cenozoic ice age in the Antarctic drove development of the antifreeze protein before or during family diversification 30 to 40 million years ago. (Auth.)

B-49561

Sullivan, C.W., et al, **Distribution of phytoplankton blooms in the southern ocean**, *Science*, Dec. 17, 1993, 262(5141), p.1832-1837, 50 refs.

A regional pigment retrieval algorithm for the Nimbus-7 Coastal Zone Color Scanner (CZCS) has been tested for the southern ocean. The pigment concentrations estimated with this algorithm agree to within 5% with *in situ* values and are more than twice as high as those previously reported. The CZCS data also revealed an asymmetric distribution of enhanced pigments in the waters surrounding Antarctica; in contrast, most surface geophysical properties are symmetrically distributed. The asymmetry is coherent with circumpolar current patterns and the availability of silicic acid in surface waters. Intense blooms (>1 mg of pigment per cubic meter) that occur downcurrent from continental masses result from dissolved trace elements such as iron derived from shelf sediments and glacial melt. (Auth.)

B-49563

Szefer, P., et al, **Concentration of selected metals in penguins and other representative fauna of the Antarctic**, *Science of the total environment*, Sep. 30, 1993, Vol.138, p.281-288, 28 refs.

Concentrations of Zn, Cu, Cd, Pb, Ag, Co, Ni, Cr, Mn and Fe were determined in muscle and liver of three species of penguins and other animals of the antarctic region. The liver was characterized by maximum concentrations of all the metals analyzed. The element levels in the samples assayed are in keeping with those reported previously by other authors. It is assumed that specific food habits of penguins are mainly responsible for elevated Cd levels in livers of these birds. (Auth.)

B-49564

Ullrich, B., Storch, V., **Development of the stomach in *Euphausia superba* Dana (Euphausiacea)**, *Journal of crustacean biology*, Aug. 1993, 13(3), p.423-431, 33 refs.

Development of the stomach, with emphasis on the filter system, was investigated in the metanauplius, calyptopis, and furcilia stages of the antarctic krill *Euphausia superba*. The metanauplius lacks an elaborated stomach as well as a connection between the esophagus and the midgut. In calyptopis I, the stomach becomes functional. The armature of the cardiac stomach consists of basic components such as lateral and ventral projections and stout spines, but not a primary filter. The latter develops before

molt beneath the cuticle and is seen in the exuvial space of calyptopis II. With molting to calyptopis III, the primary filter is elaborated and becomes capable of sorting food particles and of separating a dorsal food from a ventral filtration channel. Although in furcilia IV the spacing of spines in the primary filter is nearly identical to that in the adult specimens, the filter spines in calyptopis III are more widely separated. In all larval stages examined (except furcilia IV), the development of the pyloric stomach is delayed with respect to that of the cardiac stomach. No residues of a pyloric secondary filter system were found in developing stages of *E. superba*. (Auth.)

B-49565

Perriss, S.J., Laybourn-Parry, J., Marchant, H.J., ***Mesodinium rubrum* (*Myrionecta rubra*) in an antarctic brackish lake**, *Archiv für Hydrobiologie*, Aug. 1993, 128(1), p.57-64, 20 refs.

The occurrence of *Mesodinium rubrum* in an oligotrophic lake, Highway Lake in Vestfold Hills, during the austral summer of 1991-92 is described, together with bacteria and other protozooplankton. The ciliate reached peak densities of 2.83×10^4 during early Dec. The cells were fairly small for the species complex and contained an average of 7.6 chloroplasts per cell. It is estimated that *M. rubrum* contributed about 5.5% of community chlorophyll-*a*. To the authors' knowledge this marine ciliate has not previously been reported in a closed lacustrine environment.

B-49568

Robisson, P., Aubin, T., Bremond, J.C., **Individuality in the voice of the Emperor penguin *Aptenodytes forsteri*: adaptation to a noisy environment**, *Ethology*, Aug. 1993, 94(4), p.279-290, 45 refs.

The extreme coloniality in emperor penguins demands that (1) individual recognition by the mutual display call must be supremely adapted to the total absence of nest sites—landmarks that would facilitate partner reunion, and (2) birds must transmit a precise message through an obstructed and noisy environment. A computerized sound analysis and subsequent data were submitted to univariate and multivariate statistics to determine individual-specific cues of the call. Temporal patterning of syllables, variables of the power spectrum (frequency and timbre features) and variables of a beat generated by two acoustic sources were analyzed (58 calls from 7 animals). Number and duration of syllables, fundamental frequencies and period of the beat were highly individual, with inter-individual variation significantly greater than intra-individual variation, enabling correct classification of the 58 calls. The respective relevance of temporal and spectral cues for individual recognition is discussed. In the acoustically hostile and noisy environment, beat was peculiarly emphasized, as it allowed great precision in the production of an amplitude modulation that was unlikely to be degraded by the environment. (Auth.)

B-49569

Ashford, J.R., White, M.G., **Cross-sectional structure and validation of the timing of annulus formation in otoliths of the antarctic fish *Notothenia coriiceps* Richardson (Nototheniidae)**, *Cybiurn*, June 30, 1993, 17(2), p.153-163, With French summary. 23 refs.

To validate the timing of annuli in otoliths of immature *Notothenia coriiceps* Richardson, a time-series of samples were taken over a complete year. Light and scanning electron microscopy (SEM) techniques were used to examine the structure of sectioned otoliths. Six growth regions were identified in the otolith sections, and micro-increments were also evident. The timing of growth and annual nature of annuli revealed by SEM were demonstrated. Annuli revealed by SEM and light microscopy techniques were shown to correspond, supporting the hypothesis that annuli visible by using light microscopy represent one year. By using SEM the potential errors due to light illumination artefacts and the pseudo-hyaline features could be avoided. (Auth.)

B-49570

Øvstedal, D.O., Smith, R.I.L., ***Pertusaria signyae* (Lichenes), a new species from the Antarctic**, *Nova Hedwigia*, Aug. 1992, 55(1-2), p.179-182, 4 refs.

A saxicolous *Pertusaria* species is described as new to science: *P. signyae* Övst. from the South Orkney Is. It has an isidiate thallus, subglobose fertile verrucae with poriform apothecia, and contains 2'-O-methylp-erlatolic acid. (Auth.)

B-49571

Vezda, A., Øvstedal, D.O., Smith, R.I.L., **New *Gyalecta* species from the Antarctic: *G. pezizoides* sp. n. (lichenized fungi, Gyalectaceae)** [Eine neue *Gyalecta*-Art aus der Antarktis: *G. pezizoides* sp. n. (lichenisierte Fungi, Gyalectaceae)], *Nova Hedwigia*, Aug. 1992, 55(1-2), p.227-229, In German with English summary.

A new species of the genus *Gyalecta*, *G. pezizoides* sp. n. (lichenized Fungi, Gyalectaceae) is described and illustrated. This new species is taxonomically near to the holarctic *Gyalecta peziza* (Mont.) Anzi. (Auth.)

B-49576

Cuzin-Roudy, J., **Reproductive strategies of the Mediterranean krill, *Meganyctiphanes norvegica* and the antarctic krill, *Euphausia superba* (Crustacea: Euphausiacea), *Invertebrate reproduction and development***, Aug. 1993, 23(2), p.105-114, Refs. p.113-114.

Reproductive strategy was studied in two euphausiid species: *Euphausia superba*, which occurs in large aggregations south of the Antarctic Convergence, and *Meganyctiphanes norvegica*, from the Ligurian Sea. Both species release their eggs in the water column and have similar basic patterns of development. The early seasonal development of the gonads of *E. superba* (especially ovarian previtellogenesis) is associated with the ice-edge in spring. Egg production is strictly limited to the summer, but multiple spawns are then produced by individual females through a succession of short vitellogenic cycles. Both males and females undergo a sexual regression in winter when only basic activity of the gonads (gametogenesis) is maintained. Ovarian development of *M. norvegica* starts in Jan. (Previtellogenesis) before the spring bloom. Eggs are produced from Feb. to May by successive vitellogenic cycles. Gonadal activity is reduced during summer and autumn. These two krill species appear to have adapted their reproductive cycle to different habitats by using the flexibility of the physiological cycles involved in gonad development, a strategy that allows them to enhance fecundity and to tune the reproductive effort with food availability for the offspring. (Auth. mod.)

B-49577

Chown, S.L., **Instar number and mass of *Palirhoeus eatoni* (C.O. Waterhouse) and *Bothrometopus randi* Jeannel (Coleoptera: Curculionidae) from subantarctic Marion Island, *Coleopterists bulletin***, Mar. 1993, 47(1), p.69-73, 20 refs.

Frequency histograms of the head capsule lengths of *Palirhoeus eatoni* (C.O. Waterhouse) and *Bothrometopus randi* Jeannel larvae, collected in the field, indicate that both these epilithic ectemnorhinine species have seven larval instars. Head capsule measurements and wet masses are provided for each instar of both species. Larval activity patterns are discussed. (Auth.)

B-49581

Virtue, P., Nicol, S., Nichols, P.D., **Changes in the digestive gland of *Euphausia superba* during short-term starvation: lipid class, fatty acid and sterol content and composition, *Marine biology***, Nov. 1993, 117(3), p.441-448, 25 refs.

During a period of short-term (19 d) starvation, total lipid in the digestive gland of *Euphausia superba* Dana decreased from 21 to 9% dry weight. Total lipid per digestive gland decreased significantly during starvation compared to Day 0 individuals, falling from 1960 (+/- 172) to 385 (+/- 81) micrograms. Polar lipid was the major lipid class utilized during starvation. The relative level of free fatty acid increased significantly with starvation (4 to 39%). Absolute levels of all fatty acids per digestive gland declined continually until the end of the starvation period. Cholesterol increased from 17 (+/- 20) to 44 (+/- 13) micrograms per digestive gland by Day 3, and by Day 19 had returned to levels found in the digestive gland of Day 0 individuals. Desmosterol followed a similar pattern to cholesterol. Other sterols in the digestive gland, predominantly of algal origin, fell from the levels found in Day 0 individuals to near zero amounts by Day 6. The digestive gland of *E. superba* plays a dynamic role during short-term starvation in terms of lipid content and composition. The rela-

tive levels of polar lipids, free fatty acids and cholesterol in the digestive gland may provide reliable indices of the nutritional condition of *E. superba* in the field. Sterols in the digestive gland are indicative of recent dietary composition of krill and may also be used to quantify dietary input from individual phytoplanktonic species. (Auth. mod.)

B-49583

Wang, Z.P., **Seasonal change of respiration of *Drepanopus bispinosus* (Copepoda: Calanoida) and the effecting factors, *Antarctic research (Chinese edition)***, 1993, 5(3), p.17-26, In Chinese with English summary. 9 refs.

The oxygen consumption of wintering-over copepod *Drepanopus bispinosus*, and its relationship to the environmental parameters of a meromitic saline lake in which it lives, were determined. Results show a decreasing rate of respiration, from 0.2775 in Aug. to 0.1412 in Dec., decreasing by a further 66.93% in Jan., which is attributed to seasonal changes of dissolved oxygen content in the lake and the animal's failing physiological functions due to old age. The Q10 of female adults in natural conditions was 1.90 in Aug. and 3.13 in Jan.

B-49584

Chen, B., **Choanoflagellates from Great Wall Bay, Antarctica, *Antarctic research (Chinese edition)***, 1993, 5(3), p.27-39, In Chinese with English summary. Refs. p.37-39.

A study of the major taxa of antarctic heterotrophic nanoplankton, the choanoflagellates (Acanthoecidae) from the Great Wall Bay, is reported. Eleven species of 7 genera were recorded. The morphology, structure and geographic distribution of each species are discussed. The following are the 11 species recorded: *Acanthocorbis unguiculata*, *Bicosta spinifera*, *Calliacantha natans*, *C. simplex*, *Crinolina aperta*, *Diaphanoeca multianulata*, *D. pedicellata*, *Parvicorbicula circularis*, *P. socialis*, *Pleurasiga orculae formis* aff. and *Pleurasiga* sp.

B-49592

Robertson, G.G., **Some field techniques for ecological research on Emperor penguins *Aptenodytes forsteri*, *Marine ornithology***, 1991, 19(2), p.91-101, 18 refs.

This paper describes the following techniques for conducting ecological research on Emperor penguins *Aptenodytes forsteri*: capture and restraint, measuring body masses, marking individuals for identification, collecting stomach contents, preventing liquid radio-isotopes from freezing in subzero temperatures, handling adults during incubation and brooding, withdrawing blood samples and attaching dive recorders. The techniques described are of particular relevance to field research conducted during the antarctic winter. (Auth.)

B-49593

Kato, A., Croxall, J.P., Watanuki, Y., Naito, Y., **Diving patterns and performance in male and female Blue-eyed cormorants *Phalacrocorax atriceps* at South Georgia, *Marine ornithology***, 1991, 19(2), p.117-129, 15 refs.

The diving patterns of two male and one female Blue-eyed cormorants were recorded with continuous-recording time-depth recorders for 10-13 days during the 1990 breeding season. For the female only data on time and depth were retrieved: diving was distributed through the day (including 31% at night); mean dive depth was 63 m. Males dove mainly in the afternoon and evening. Their mean dive depths were 61.4 and 83.9 m; mean dive durations 3.4 and 4.6 min; time at maximum depth (bottom time) averaged 28 and 44% of time submerged; descent time (0.4 and 0.5 min) was shorter than ascent time (1.6 and 2.9 min); dive/pause ratios were 0.4 and 0.5 and surface interval was not increased with preceding dive duration. The incubating male making one long dive bout per day made fewer, longer dives, with less overall bottom time, than the chick-rearing male, which made at least two bouts per day. Most characteristics of diving in 1990 (a year of average breeding success) were similar to data from 1989 (a year of breeding failure). However, there were more and shorter dive bouts in 1989 and shallow (travelling) dives were more frequent: both consistent with lower prey availability in 1989 necessitating frequent changes of foraging sites. (Auth.)

B-49594

Berteaux, D., **Long range movement of a Cape gannet *Morus***

capensis in the southern Indian Ocean, *Marine ornithology*, 1991, 19(2), p.134-135, 9 refs.

On Oct. 24 and 25, 1989, an adult Cape gannet bearing ring no. 9-41489 was observed in the center of the actively breeding colony of Yellow-nosed albatrosses *Diomedea chlororhynchos* at Amstersdam I. The gannet occupied an empty Yellow-nosed albatross nest, and was observed removing material (grasses) from adjacent nests to its own nest. The presence of many droppings around its nest implied that the gannet had been present for several days. This individual was observed again in the albatross colony on Nov. 20, 1989 and Jan. 15, 1990. The following summer it was again noted in the same place from Oct. 2-7 and 20-30, 1990. During these two latter periods the gannet occupied a nest entirely of its own construction. It was frequently observed performing "bowing" behavior (which signifies site ownership) and actively defended its nest against albatrosses.

B-49595

Genevois, F., Chastel, O., **Antarctic fulmar *Fulmarus glacialis* feeding on land**, *Marine ornithology*, 1991, 19(2), p.136-138, 18 refs.

Of the 95 species of the seabird family Procellariidae only the two giant petrels *Macronectes* spp. and the Snow petrel *Pagodroma nivea* have been reported to feed on land. In this note, the authors add this previously unexpected technique to the repertoire of another, the Antarctic fulmar, one of the fulmarine petrels, a group of taxonomically related species exhibiting scavenging behavior.

B-49596

Orgeira, J.L., Fogliatto, O.N., **Blacknecked swan *Cygnus melanocoryphus* in Antarctica**, *Marine ornithology*, 1991, 19(2), p.140-143, 5 refs.

During the 1988/1989 austral summer, while aboard the *Bahia Paraiso* and the *Irizar* of the Argentine Antarctic Institute, the authors observed two individual Blacknecked swans in the Antarctic Peninsula region. One was sighted on Jan. 8, 1989 in Hope Bay. The other individual was seen on Feb. 2, 1989, on Livingston I. In addition, Blacknecked swans were sighted at various antarctic stations. It is concluded that individuals arrive as vagrants following severe storms, which frequently affect the south part of the continent, causing deviations from the birds' usual migratory routes.

B-49597

Du Plessis, C.J., Seddon, P.J., Van Heezik, Y.M., Adams, N.J., **Aspects of the incubation period of the King penguin *Aptenodytes patagonicus* at Archway Bay, Marion Island**, *Marine ornithology*, 1991, 19(2), p.148-151, 12 refs.

In this note the authors present information on egg dimensions, incubation shifts and incubation period for King penguins at Archway Bay, Marion I., in the Prince Edward I. group. The study took place during Aug. 1988 to May 1989. Additional information on fresh egg mass was collected from the same locality in 1984. Archway Bay, situated on the east coast of Marion I., contains a medium-sized King penguin colony of approximately 2,500 breeding pairs. The colony was monitored daily from the periphery, from before egg-laying (mid-Nov.) until the end of the incubation period (Mar.) to determine incubation periods and shift lengths for individual pairs. Egg shells carried outside the colony by subantarctic skuas *Catharacta antarctica* were also collected.

B-49601

Song, W.B., **Studies on the morphology of three tintinnine ciliates from the Weddell Sea, Antarctic (Ciliophora. Tintinnina)**, *Antarctic research (Chinese edition)*, 1993, 5(2), p.34-42, In Chinese with English summary. 9 refs.

As a contribution to the infraciliature of tintinnine ciliates, the morphology of 3 antarctic species (*Codonellopsis glacialis* Laackmann, 1907, *Cymatocylis canvallaria* Laackmann, 1910 and *Cymatocylis vanhoeffeni* Laackmann, 1907) was investigated following protargol silver impregnation. The materials were collected during the cruise ANT X/3, (1992) in the Weddell Sea. The results demonstrate that the specific organization of both oral and somatic ciliature varies considerably among species or gen-

era and is nearly constant within species. The amount of variation in the lorica morphology and infraciliature of *C. canvallaria* and *C. vanhoeffeni* suggests that separation of the two congeners may be reasonable. (Auth.)

B-49602

Zhu, G.H., Chen, S.H., Zhao, G.F., **Study on nano- and microalgae in adjacent waters of Antarctica. III. Species composition of nano- and microalgae in the stomach contents and feces of *Euphausia superba* Dana in adjacent waters of the South Shetland Islands**, *Antarctic research (Chinese edition)*, 1993, 5(2), p.43-51, In Chinese with English summary. 11 refs.

Diet components of 340 specimens of krill in 12 sex stages were analyzed and studied in waters around the South Shetland Is. by optical microscopy and scanning electron microscopy. One hundred thirty-five taxa of nano- and microorganisms were found in krill stomach contents and feces, including about 60% of diatoms, 15.5% of protozoa, 12.6% of dinoflagellates, 5.2% of haptophyceae, 3.7% of craspedophyceae, and 3.0% of other species. Nanoplanktonic diatoms and flagellates smaller than 20 microns constituted 85% of all foods of *E. superba*. The most important species were *Nitzschia angulata* f. *minima*, *N. curta* and *Chrysosomum* sp. The mean cell number of these species was about 56.99 cells. The extent of full stomach contents of *E. superba* increases with the developing of sexual maturation. (Auth.)

B-49606

Van Tussenbroek, B.I., **Plant and frond dynamics of the giant kelp, *Macrocystis pyrifera*, forming a fringing zone in the Falkland Islands**, *European journal of phycology*, Aug. 1993, 28(3), p.161-165, 11 refs.

Fluctuations in plant and frond characteristics are described for *Macrocystis pyrifera* (L.) C. Agardh (Laminariales, Phaeophyta) forming a fringing zone in the Falkland Is. Giant kelp plants were sampled along a transect in the austral autumn (May 1986) and late spring (Dec. 1986) which, according to previous frond weight analysis, were the times when extremes in population parameters were expected. Plant density and hold-fast wet weights were similar for both seasons, but plants had more fronds and the fronds weighed more in spring than in autumn. Production of new fronds and loss of old fronds were determined at monthly intervals between Apr. 1986 and Mar. 1987. New frond production rates followed fluctuations in the level of light, and varied between 0.08 and 0.48 fronds per plant per day. Frond loss rates did not show a seasonal pattern but fluctuated between 0.05 and 0.42 fronds per plant per day. It is suggested that the Falkland Is. *Macrocystis* population is more stable than most other giant kelp beds at high latitudes because of the absence of winter storms. (Auth. mod.)

B-49613

Godlewska, M., **Acoustic observations of krill (*Euphausia superba*) at the ice edge (between Elephant I. and South Orkney I., Dec. 1988/Jan.1989)**, *Polar biology*, Nov. 1993, 13(8), p.507-514, Refs. p.513-514.

The effect of the ice edge on antarctic krill abundance, swarm parameters, distribution and migration were investigated using acoustics. Two parameters, overall abundance and inter-swarm distance, were found to increase with distance from the ice edge, while the number of swarms per unit distance decreased. Swarm dimensions, length and thickness do not seem to depend on proximity of ice. Krill near the ice-edge undergo diurnal vertical migration with a periodicity of 12 hours and an amplitude of about 6 m. Juvenile krill of 31 mm were dominant in the area investigated. (Auth.)

B-49614

Fabiano, M., Povero, P., Danovaro, R., **Distribution and composition of particulate organic matter in the Ross Sea (Antarctica)**, *Polar biology*, Nov. 1993, 13(8), p.525-533, Refs. p.532-533.

The biochemical composition and spatial distribution of particulate organic matter (POM) were studied in the Ross Sea in summer of 1989 to assess the quantitative role of organic carbon fractions in the cycling of organic matter in the water column. Large differences in chemical composition were observed between surface and deep layers. The results indicated that despite large geographical differences, POM was quite

homogeneous, of phytoplankton origin and mostly detrital. Different ratios were used to investigate the changes in biochemical composition of particulate organic matter in relation to the ice-melting: C:N (organic carbon: organic nitrogen ratio) and C-POM:POC (sum of carbohydrate, protein and lipid carbon:total organic carbon ratio) were used to analyze the percentage of refractory organic material. PPRT:PCHO (protein:carbohydrate ratio) were used to establish POM "age" and RNA:DNA ratios as a relative measure of particular activity; POC:Chl *a* and N-PPRT:Chl *a* ratios were used to estimate the autotrophic contribution to the suspended particulate organic matter. Despite its low caloric value, a high caloric content was found in the photic layer, thus indicating that a large amount of food was available to higher trophic levels. (Auth.)

B-49615

Smith, R.I.L., **Vegetation of Cockburn Island, Antarctica**, *Polar biology*, Nov. 1993, 13(8), p.535-542, 25 refs.

Cockburn I., off the northeast Antarctic Peninsula, is important in the history of antarctic terrestrial biology as it was here that the first botanical collections were made by I.D. Hooker in 1843. These, and a subsequent collection made by I.M. Lamb 100 years later, are described here. A much more detailed survey of the vegetation of the island was made in 1989. At least nine moss, 34 lichen, three cyanobacteria and one algal taxa were recorded, and the floristic composition of several distinct communities was assessed. The floristically most interesting and diverse sites are on the island's 250 m high plateau which has seepage areas and well-developed networks of polygons and stone circles. The vegetation is similar to that occurring on the mainly sedimentary deposits and rocks of nearby James Ross and Seymour islands, but significantly different from that on the more acidic soils and rocks which predominate throughout much of the maritime Antarctic. (Auth.)

B-49616

Riemann, F., Tendal, O.S., Gingele, F.X., ***Reticulammina antarctica* nov. spec. (Xenophyophora, Protista) from the Weddell Sea, and aspects of the nutrition of xenophyophores**, *Polar biology*, Nov. 1993, 13(8), p.543-547, Refs. p.546-547.

Xenophyophores, large deep-sea rhizopodan protists, are very rare in antarctic seas. One specimen of *Reticulammina antarctica* nov. spec. was retrieved from bathyal depths in the Weddell Sea and preserved in a comparatively good condition, thus allowing a cytological description. Faecal pellets (stercomata) enclosed within the test were found to consist primarily of mineral particles. The hypothesis is offered that nutritional nitrogen compounds adsorbed by clay minerals can be extracted by these deep-sea rhizopods. (Auth.)

B-49617

Koubbi, P., **Influence of the frontal zones on ichthyoplankton and mesopelagic fish assemblages in the Crozet Basin (Indian sector of the Southern Ocean)**, *Polar biology*, Nov. 1993, 13(8), p.557-564, Refs. p.563-564.

One of the aims of oceanographic campaign MD 68/SUZIL, carried out in austral autumn 1991 in the Indian sector of the southern ocean and its adjacent subtropical waters, was to investigate the influence of hydrography on the ichthyoplankton and mesopelagic fish assemblages in the Crozet basin. It appears that, in contrast to other sectors of the southern ocean, the main biogeographical barriers are the Subantarctic Front and the Agulhas Front which appear to be "vertical convergence fronts". The importance of the Antarctic Polar Front and the Subtropical Front as barriers to fish seems to be minimized in this area because of its particular hydrological features, such as the lack of a subantarctic zone, the maximum current intensity of the Subantarctic Front between these fronts, and their structures: they are horizontal convergence fronts. (Auth.)

B-49618

Ott, S., Sancho, L.G., **Morphology and anatomy of *Caloplaca coralligera* (Teloschistaceae) as adaptation to extreme environmental conditions in the maritime Antarctic**, *Plant systematics and evolution*, Mar. 1993, 185(1-2), p.123-132, 16 refs.

The anatomic and morphological structure of the lichen *Caloplaca coralligera* (Hue.) Zahlbr. was investigated in connection with mechanisms of colonization and adaptation to the special conditions of the maritime Antarctic. *C. coralligera* seems to be endemic to the antarctic region.

The lichen is unique in its morphology, growing like a crustose lichen with a prothallus, but the actual thallus being composed of many vertical, frutescent branches not higher than large isidia. Due to fusions of the distal parts of the branches, the morphology is characterized by air-filled cavities between the erect thallus parts where the phycobionts are located only close to the outermost surface. But also anatomically a system of air-filled cavities is developed by a net-like structure of hyphae. This may result in an insulation from temperature exchanges with the rocky substrate. It is speculated that this peculiar thallus structure might be advantageous to a lichen growing on compact substrates by buffering the diurnal temperature extremes which are characteristic for rocks under a strong radiation exchange with the ambient atmosphere. (Auth.)

B-49620

Ponganis, P.J., et al, **Muscle temperature and swim velocity profiles during diving in a Weddell seal, *Leptonychotes weddellii***, *Journal of experimental biology*, Oct. 1993, Vol.183, p.341-348, 14 refs.

Locomotorily muscle temperature and swim velocity profiles of an adult Weddell seal were recorded over a 21 h period. The highest temperatures occurred during a prolonged surface period (mean 37.3 C, S.D. 0.16 C). Muscle temperature averaged 36.8 and 36.6 C (S.D. 0.25 C, 0.19 C) during two dive bouts and showed no consistent fluctuations between dive and interdiver surface intervals. Swim velocities were also constant, near 1.3 m/s. These data indicate that past records of low aortic temperatures (35 C) during and after prolonged dives are not indicative of whole-body temperature changes, and that muscle temperature, even during dives as long as 45 min, remains near 37 C. (Auth.)

B-49621

Ambom, T., Fedak, M.A., Boyd, I.L., McConnell, B.J., **Variation in weaning mass of pups in relation to maternal mass, postweaning fast duration, and weaned pup behavior in southern elephant seals (*Mirounga leonina*) at South Georgia**, *Canadian journal of zoology*, Sep. 1993, 71(9), p.1772-1781, Refs. p.1780-1781.

Female southern elephant seals assemble in large groups and each gives birth to a single pup which is nursed for some 3 weeks. Weaning mass is highly variable; some pups are three times as heavy as others at weaning. After weaning, the pup fasts for several weeks before departing to sea. The function of this fast is unknown. The authors examined the relationships between maternal mass, pup weaning mass, and pup behavior during the postweaning fast in 377 pups and 128 adult females over 4 breeding seasons at South Georgia. Pup weaning mass was positively related to maternal postpartum mass, which accounted for 55% of the variation in weaning mass. Over all 4 years the male pups were significantly heavier at weaning than female pups (130 vs. 123 kg), but this difference disappeared after maternal mass was controlled for. After fasting for 21-66 days, weaned pups went to sea at an average of 68% of weaning mass. Heavier pups remained on the beach longer after weaning than lighter pups. There was no evidence that pups synchronized their departure to sea. Only male pups were observed to take part in mock fights. With increasing age, weaned pups spent more time in the water. Mortality during the postweaning fast was negligible (0.1%). The timing of departure of weaned pups may involve a tradeoff between an early departure with greater fat (energy) stores but poorer forging ability, or a late departure with increased swimming, diving, and social skills but reduced fat stores. (Auth.)

B-49622

Handa, N., Nakatsuka, T., **Vertical fluxes of organic materials in the northern North West Pacific and Breid Bay, Antarctica, with special reference in the effect of phytoplankton bloom**, *Elsevier oceanography series*, 1993, Vol.59, Deep ocean circulation, physical and chemical aspects, edited by T. Teramoto, p.221-233, Refs. p.231-233.

DLC GC228.5.D44

Mooring systems were deployed at the sediment trap sites in the northwestern Pacific Ocean in Sep. 1988-May 1989, and in Breid Bay, Antarctica, in Dec. 1985-Feb. 1986. Organic carbon and nitrogen fluxes were determined for both regions. High values of $\delta^{13}C$ were found in the sinking particles collected in both ocean areas, coinciding with maxi-

mum carbon and nitrogen fluxes observed at the time and suggesting that the organic matter was derived from the phytoplankton in the logarithmic phase of their growth. Increased abundance of glucose and/or glucan was found in the water-extractable carbohydrate of the sinking particles collected from Breid Bay in early Jan. 1989, indicating that the phytoplankton cell of the late logarithmic to stationary phases had to be the source of the organic matter in the sinking particles. (Auth. mod.)

B-49634

Lancelot, C., et al, **Carbon and nitrogen cycling through the microbial network of the marginal ice zone of the southern ocean with particular emphasis on the northwestern Weddell Sea**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.1, Brussels, Belgian Science Policy Office, 1993, 110p., Refs. p.103-110.

Detailed biological measurements (phyto- and bacterioplankton biomass and activity and counting of two classes of protozooplankton) were carried out in the marginal ice zone of the northwestern Weddell Sea during sea ice retreat 1988 (EPOS expedition, Leg 2). These measurements clearly showed enhanced phyto-, bacterio- and protozooplankton production in the marginal ice zone, as compared to adjacent open sea and permanently ice-covered areas. The combined analysis of available physical, chemical and biological observations indicated that the initiation of the phytoplankton bloom—dominated by nanoplanktonic species—was determined by physical processes operating in the marginal zone at the time of ice melting. On the basis of these data, as well as of physical measurements related to the hydrodynamical stability of the water column, a coupled hydrodynamical-biological model describing the microbial network developing at the receding ice-edge of the circumpolar marginal ice zone of the southern ocean has been established. This model takes into account the various physical and biological controls exerted on phytoplankton development, and allows calculation of carbon and nitrogen circulation through the lower trophic levels of the pelagic ecosystems. (Auth. mod.)

B-49638

Goffart, A., Hecq, J.H., **Biochemistry and ecodynamics of the southern ocean**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.1, Brussels, Belgian Science Policy Office, 1993, 56p., Refs. p.51-56.

The goal of this study was to determine how the distribution and biochemical speciation of planktonic production is controlled by abiotic parameters of the environment, such as ice melting, pack-ice retreat, vertical stratification and various mesoscale frontal systems. The factors affecting planktonic spring blooms at the level of the ice edge and of the adjacent open waters were particularly emphasized, both in the Weddell Sea and in the Ross Sea. Lipids and liposoluble pigments of plankton and krill have been especially used as biotracers. The interpretation of the whole set of data collected during EPOS leg 1 in the Weddell Sea showed that in early spring (Oct.-Nov. 1988), the vertical stratification and horizontal distribution of water masses control the main development of phytoplankton blooms, restricted to the ice edge. Observations on samples obtained from Nov. 1989 to Feb. 1990 in the Ross Sea confirmed that the most important factors regulating the antarctic pelagic food chain are physical processes operating within the circumpolar marginal ice zone during the ice melting period. (Auth. mod.)

B-49646

Stenroos, S., **Taxonomy and distribution of the lichen family Cladoniaceae in the antarctic and peri-antarctic regions**, *Cryptogamic botany*, Aug. 1993, 3(4), p.310-344, Refs. p.342-344.

Specimens of Cladoniaceae from 28 herbaria were studied using methods of classical herbarium taxonomy and thinlayer chromatography. Thirty-nine species, representing the genera *Cladia*, *Cladina* and *Cladonia*, are recognized in the study area. Most species show a “bipolar or cosmopolitan” distribution pattern, and only 4 are endemic to the area. One third of species belong to a so-called Southern Hemisphere element. Long-distance dispersal is considered to be the most important way of reaching new areas in the fragmented southern areas, past and present.

Three species, viz. *Cladonia archeri* Stenroos (Macquarie I.), *C. marionii* Stenroos (Marion I.) and *C. albata* Stenroos (Prince Edward I.) are described as new. New synonyms are *Cladonia subdigitata* Nyl. and *C. corallifera* subsp. *subdigitata* Vainio (= *C. ustulata*), *C. furcata* var. *subpungens* Müll. Arg. and *C. patagonica* A. Evans (= *C. squamosa*), and *C. subantarctica* Filson & Archer (= *C. subsubulata*). Nine of the present species (*C. cf. cariosa*, *C. merochlorophaea* (var. *novochlorophaea*), *C. ochrochlora*, *C. phyllophora*, *C. cf. poeciloclada*, *C. subulata*, *C. sulphurina*, *C. cf. tapperi* and *C. weymouthii*) have not been correctly reported from the area before. (Auth.)

B-49647

Hoggarth, D.D., et al, **Life history of the lithodid crab, *Paralomis granulosa*, in the Falkland Islands**, *ICES journal of marine science*, Nov. 1993, 50(4), p.405-425, 27 refs.

The life history of the lithodid crab *Paralomis granulosa* is investigated from a 16-month time series of commercial catches and scientific samples from the Falkland Is. The mean size at morphological maturity of male crabs is estimated from chelae allometry to be 52 mm carapace length (CL), and the size at 50% functional maturity of females is found to be 46 mm CL. Adult *P. granulosa* live in sheltered inshore waters mostly between 10 and 40 m deep; juvenile crabs inhabit the dense kelp beds in the shallowest part of this range. The percentages of the total stock in each combination of molt stage and reproductive condition are estimated for each month. A proportion of the female crabs, increasing in the largest sizes, molt without ovulating. At all times of year, large numbers of females also exist in intermolt condition, still with uneyed eggs, suggesting that the reproductive cycle takes longer than 1 year to complete. Juvenile crabs molt at least annually, along with the smaller adult males. A biennial molt cycle is proposed for most adults of both sexes. These main communities occur in each of the molting and non-molting seasons. The most central community, in the deepest water on a soft, muddy substratum, forms the main mating aggregation of the Choiseul Sound stock, containing molting females and the largest non-molting males. Incubating females, mid-way through their 2-year cycle, migrate off the spawning ground to more peripheral areas. The majority of adult males in molting condition (along with a few large, apparently non-mating females) occur on the shallowest coastal grounds. It is proposed that adult males alternate between molting feeding on warmer shallow grounds in some years, and attending the central mating aggregation without molting, in others.

B-49648

Hayward, P.J., **New species of cheilostomate Bryozoa from Antarctica and the subantarctic southwest Atlantic**, *Journal of natural history*, Nov.-Dec. 1993, 27(6), p.1409-1430, 18 refs.

Fourteen new species of Bryozoa Cheilostomatida are described in the genera *Chaperiopsis*, *Dakariella*, *Plesiothoa*, *Celleporella*, *Galeopsis*, *Osthimosia*, *Reteporella*, *Rhynchozoon* and *Turritigera*. *Acanthophragma* gen. nov. is introduced for *A. polaris* sp. nov., and *Tracheloptyx* gen. nov. for *T. antarctica* sp. nov. (Auth.)

B-49649

Best, P.B., et al, **Long-range movements of South Atlantic right whales *Eubalaena australis***, *Marine mammal science*, July 1993, 9(3), p.227-234, 16 refs.

Movements of southern right whales between Gough I. and South Africa, and between Argentina and Tristan da Cunha, southern Brazil, and South Georgia are documented through matching of 6 photoidentified individuals. These include the resighting of a male in a mid-oceanic locality some 4,424 km away from (and 11 yr after) its last sighting in a coastal area where it had been seen in 6 of the preceding 8 years; a female photographed in mid-Atlantic resighted with a calf in a coastal nursery area 2,769 km away; resightings of females with calves in different nursery areas 2,051 km apart in different years; and the first example of a link between a coastal nursery area and a feeding ground in high latitudes. The possible implications of these movements for estimates of calving interval and survival rate based on resightings in coastal waters are discussed. The potential for intermingling between populations on either side of the South Atlantic seems greater than was previously considered likely from a comparison of animals photographed in coastal waters. (Auth.)

B-49659

Laternus, F., **Formation and release of low-molecular weight**

halogenated hydrocarbons by macroalgae from polar regions [Bildung und Abgabe kurtzkettiger halogenierter Kohlenwasserstoffe durch Makroalgen der Polarregionen], *Berichte zur Polarforschung*, 1993, No. 132, 188p., In German with English summary. Refs. p.153-165.

A method was developed to determine the release rates of volatile halogenated organic compounds (VHOC) from polar macroalgae under natural conditions. Bromoform was released in highest quantities from all macroalgae investigated. In general, high release rates of VHOC were found for the arctic brown and green algae. In the Antarctic, brown algae showed on the average the highest release rates. In the Antarctic Peninsula area, *Himantothallus grandifolius*, *Desmarestia anceps* and *Desmarestia menziesii* are a main source for the input of biogenic VHOC into the antarctic environment. Release rates of VHOC from algal cultures and field samples were generally higher in the field samples. For algae of the same species release rates are the same for occurrences in both polar regions. The release rates of the VHOC are dependent on the photon fluences rate. In darkness only low rates were measured. With increasing irradiance higher release rates were observed. Macroalgae in the surface waters with high photon fluences rate showed higher rates than algae in deeper parts. The release rates were also dependent on salinity changes. Algae exposed alternately to seawater and distilled water showed an increase in the release rates with longer incubation time. The investigation of different parts of macroalgae revealed no preferable place for formation and release of VHOC. Within the same species releasing rates are dependent on the algae surface.

B-49672

Robertson, G., **Population size and breeding success of emperor penguins *Aptenodytes forsteri* at Auster and Taylor Glacier colonies, Mawson Coast, Antarctica**, *Emu*, July 1992, 92(2), p.65-71, 8 refs.

The population size and breeding success of Emperor penguins at the Auster and Taylor Glacier colonies were estimated during the 1988 breeding season. At Auster a total of 10,963 pairs produced about 6,350 fledglings for a breeding success of 58%. At Taylor Glacier about 2,900 pairs raised 1,774 fledglings for a breeding success of 61%. Fledglings left Taylor Glacier over a period of 33 days at a mean mass of 10.56 kg. (Auth.)

B-49675

Ingole, B.S., Parulekar, A.H., **Zooplankton biomass and abundance of antarctic krill *Euphausia superba* Dana in Indian Ocean sector of the southern ocean**, *Journal of biosciences*, Mar. 1993, 18(1), p.141-148, 29 refs.

Zooplankton sampling was carried out during 1981-1987 to estimate krill abundance in the Indian Ocean sector of the southern ocean. This study aims to understand the distribution of biomass of zooplankton, especially krill, using data collected by net sampling techniques. Total zooplankton biomass for all the sampling stations ranged from 9 to 684 ml/1000 m³. Biomass data grouped by 5 deg latitude interval shows the presence of higher biomass in the antarctic divergence region between 60 to 65S. Krill formed a considerable component of biomass and together with eggs and larvae represented over 60% of the mean total zooplankton-biomass in the coastal ice region. The values for population density and biomass of adult-size krill varied between 0 to 4320 individuals and 6 to 305 ml/1000 m³, respectively. The highest values were recorded between 62 to 69S and between 16 to 30E. A high density of krill larvae was encountered in the shelf region during Jan. 1987 which was related to chlorophyll concentration. However, the values obtained during six consecutive summers showed that an adult krill biomass at a given location was highly variable, and hence not comparable on inter-annual basis, during the sampling years. (Auth. mod.)

B-49685

Keys, J.R., **Environmental impact assessment: process and concerns**, Antarctic Stratigraphic Drilling, Cape Roberts Project, Workshop report. Royal Society of New Zealand, Misc. Ser. No.23, Wellington, New Zealand, 1992, p.27-31.

A reliable environmental impact assessment is required for the proposed Antarctic Stratigraphic Drilling (ASD) off Cape Roberts. The Planning Workshop agreed that the assessment process should continue under New Zealand auspices. Following the new Protocol for Environmental

Protection (PEP) recently added to the Antarctic Treaty system and environmental concerns with drilling in the Antarctic, a proactive approach is urged in establishing a model assessment process involving international consultation. The assessment process is beginning with the preparation of a draft Comprehensive Environmental Evaluation (CEE). This will be based largely on information already known about the Cape Roberts area and the type of drilling proposed, but will also require some specific field studies. It has been completed and circulated to national antarctic agencies and public interest groups (Nov., 1992). The second part of the assessment process is a review of the draft CEE in the light of comments made by those circulated, and the publication of a final version. This must be completed by Oct. 1, 1993 at the latest, and show that all concerns have been addressed for the project to proceed.

B-49688

Wasik, A., Mikolajczyk, E., **Morphology and ultrastructure of the antarctic ciliate, *Cymatocylis convallaria* (Tintinnina)**, *Acta protozoologica*, 1992, 31(4), p.233-239, 34 refs.

The morphology and ultrastructure of the tintinnid ciliate *Cymatocylis convallaria*, a planktonic species restricted to antarctic waters, were examined. The structures common for all ciliates, as well as those characteristic of tintinnids, are described. The ultrastructure of the lorica changes from trilaminar at the horn, through bilaminar in the middle part, to monolaminar near the collar. The capsules are typical intracellular elements for all tintinnids; however, fibrillar connections between them and the affiliated caps as well as between the caps and plasmalemma are described for the first time. The structures called "morulas", formed by loosely and closely packed osmophilic globules, are noted. The simultaneous presence of differently compact "morulas" has not been previously reported. Although the ultrastructure of *C. convallaria* is typical for Tintinnina in general, some features seem to be characteristic for this species. (Auth.)

B-49689

Hédoin, H., Couté, A., **Preliminary study of marine nanoplankton of the Kerguelen Archipelago (T.A.A.F.)** [Étude préliminaire du nanoplankton marin de l'Archipel des Kerguelen (T.A.A.F.)], *Cryptogamie. Algologie*, 1992, 13(2), p.121-142, In French with English summary. 64 refs.

The results of an inventory concerning the nanoplankton of the Golfe du Morbihan in the Kerguelen Is. are presented. Scanning electron microscopy was used to observe 58 taxa, 23 of which were identified to the species level. They either belong to phyto- or zooplankton. Some of them, as *Triparma laevis* and *Tetraparma pelagica* (Parmales), are new for this part of the world. An attempt is made to make a quantitative estimation of the populations. (Auth. mod.)

B-49690

Hoppe, G.M., McAdam, J.H., **Management of a tussock grass community for wildlife, tourism and agriculture**, *Aspects of applied biology*, 1992, Vol.29, p.377-381, 12 refs.

Tussock grass is a coastal tussock-forming grass which is potentially the most important terrestrial ecological niche in the Falkland Is. It is the most productive and nutritious native grass, hence it is of value for wildlife conservation and agriculture. The integration of agriculture and conservation and the impact of tourism within the Islands are issues of growing concern. Sea Lion I. has a history of agriculture and has been recently developed for tourism, both activities being heavily dependent on the Tussock grass community. The integration of agriculture and conservation, particularly in relation to tourism and the changing role of agriculture on the island, are outlined and discussed. Research aimed at the re-establishment of the Tussock grass habitat is of key importance in any development of the island. Possible strategies for future management are discussed. (Auth.)

B-49691

McKenna, J.E., Jr., **Spatial structure and temporal continuity of the South Georgian antarctic fish community**, *U.S. National Marine Fisheries Service. Fishery bulletin*, July 1993, 91(3), p.475-490, 51 refs.

The spatial structure of the South Georgian fish community was investigated through the use of survey data collected over a three-year period. The results clearly indicated the absence of spatial structure in that community. The presence or absence of rare species at various stations was responsible for the weak structure found in the initial analysis. The general lack of structure was consistent from year to year. The available data do not provide an explanation for this lack of structure. All surveys were conducted during the austral summer only. Events and community structure at other times of the year remain unknown. Although the data were representative of the fish community during the austral summer, no comparable data were available on the abundance and distribution of their prey items, especially krill. More extensive sampling, expanded to include other seasons, is necessary to properly address the questions of seasonal change in community structure and the role of competition in this antarctic system. (Auth. mod.)

B-49692

Oppenheim, D.R., Paterson, D.M., **Fine structure of an algal mat from a freshwater maritime antarctic lake**, *Canadian journal of botany*, 1990, 68(1), p.174-183, With French summary. 38 refs.

The three-dimensional microstructure of *Tolypothrix* mats from the bottom of a maritime antarctic lake on Signy I. was examined. Samples from mats at two depths, 4 and 6 m, within the lake were taken by scuba divers and frozen (-80 C) in Mar. 1987. The samples were freeze-fractured and examined by ambient and low temperature scanning electron microscopy (LTSEM). The mats shared a similar structure consisting of a compact lower zone of prostrate filaments and an upper zone of loose vertical filaments. An outer layer of extremely loose spreading filaments was only found by LTSEM, leading to the conclusion that some collapse of the mat structure occurred during dehydration for ambient SEM. Fine detail of the mat matrix such as the attachment of epiphytes and associated microfauna to the filaments was often obscured by mucilage. Fast-particle etching was used to remove this mucilage and also the organic coat that covers uncleaned diatoms, thereby allowing the identification of attached cells *in situ*. Several attachment strategies were observed, although sessile forms were most common. Further fast-particle etching of the epiphytic diatom assemblages revealed that many of the attached diatoms were devoid of cell contents. Together with the epiphytic diatoms a variety of microfauna were identified, both incorporated within the mat and on the mat surface. The implications of these observations are discussed. (Auth.)

B-49707

Lunn, N.J., Boyd, I.L., Barton, T., Croxall, J.P., **Factors affecting growth rate and mass at weaning of antarctic fur seals at Bird Island, South Georgia**, *Journal of mammology*, Nov. 1993, 74(4), p.908-919, 43 refs.

The influence of sex of pup, maternal age, birth date of pup, number of foraging trips, and the mean duration of foraging trips at sea and nursing visits ashore on the growth and mass at weaning of pups of antarctic fur seals were studied during austral summers of 1988-1990. Growth rates of males and females varied considerably between 1972 and 1991 and appeared to decline from 1984 through 1990. Growth rates of male and female pups did not differ when weighed serially (same individuals weighed throughout lactation), but males grew faster than females when weighed cross-sectionally (different individuals weighed throughout lactation). Based on the results of pairs of mothers and pups followed over the lactation period, maternal investment was greater in males than females because males were heavier at birth and older at weaning than females and not because of any differential growth between the sexes. Mothers appear to have to work longer, but not harder, to wean males than females. Under the favorable feeding conditions that usually exist, individual differences in the growth of pups are most likely influenced by variation in foraging efficiency of mothers. (Auth. mod.)

B-49709

Kawecka, B., Olech, M., **Diatom communities in the Vanishing and Ornithologist Creeks, King George Island, South Shetlands, Antarctica**, *Hydrobiologia*, Oct. 29, 1993, Vols.269/270, p.327-333, 22 refs.

In the diatom communities of the Vanishing and Ornithologist Creeks 74 taxa were found. Most of the taxa have a cosmopolitan range and are resistant to various environmental stresses. For example, *Achnanthes lan-*

ceolata var. *lanceolata* is found in all types of waters and in several ecological conditions. *Achnanthes delicatula* ssp. *delicatula*, *Nitzschia frustulum*, *N. capitellata*, *Navicula mutica*, and *N. gregaria* develop both in fresh and brackish waters. Some of the organisms also settle in terrestrial environments. *Navicula atomus*, *N. mutica*, *Pinnularia borealis*, and *Hantzschia amphioxys* are common soil algae. *Navicula digitulus*, *N. contenta*, *N. cohnii* and *Achnanthes coarctata* also live in an aerial environment. *Navicula atomus* is well developed in eutrophic waters and *Nitzschia capitellata* can tolerate a high level of pollution, while *Nitzschia gracilis*, *Fragilaria capucina*, and *F. alpestris* appear both in oligotrophic and enriched waters. Stenotopic ecological features are shown by *Achnanthes marginulata* and *N. digitulus*—known from the Alps and the North, and *N. muticopsis*, characteristic for the Antarctic and Subantarctic. The index of diatom biomass, usually of low and medium value, was highest in the area of possible impact by a penguin colony. (Auth.)

B-49711

Wharton, D.A., Block, W., **Freezing tolerance in some antarctic nematodes**, *Functional ecology*, Oct. 1993, 7(5), p.578-584, 28 refs.

Nematodes are an important component of the terrestrial antarctic biota and must survive exposure to sub-zero temperatures. This paper shows that a number of antarctic nematodes are freeze tolerant. The cold tolerance strategies of nine taxa of terrestrial antarctic nematodes from a variety of mosses and an alga during freezing in contact with water were examined. They could all survive exposure to -15 C, although survival was lower than in non-frozen controls. *Teratocephalus tilbrookii* and *Coomansus gerlachei* were the best survivors after freezing, while *Panagrolaimus* sp. was the worst. There were no significant differences in survival between nematodes isolated from different mosses/algae or between adult and juvenile nematodes. Observations of freezing using a cryomicroscope showed that most species froze shortly after the water in the sample froze. *Ditylenchus* sp. was the only species which showed any ability to restrict exogenous ice nucleation. The nine taxa of nematodes examined thus exhibit a freeze-tolerant strategy in contact with water, freezing by exogenous ice nucleation from the surrounding medium. (Auth.)

B-49712

Kureishy, T.W., Sen Gupta, R., Mesquita, A., Sanzgiry, S., **Heavy metals in some parts of Antarctica and the southern Indian Ocean**, *Marine pollution bulletin*, Nov. 1993, 26(11), p.651-652, 5 refs.

The incursion of industrial and agricultural chemicals into the antarctic regions is investigated. Zooplankton and krill were taken from the southern Indian Ocean from offshore of the Indian Station Dakshin Gangotri to 30S. Lichens, moss, and sediments were analyzed from soil and sediment in and around three lakes in the Schirmacher Hills region. Hand-picked feathers from Emperor penguins were also examined. Heavy metals found in all of these samples include Pb, Cu, Ni, Co, and Cd. Glacial lakes in the Schirmacher Hills showed high concentrations of most metals; mosses and lichens showed high concentrations of Cu; penguin feathers showed only Cu in concentrations of 15 micrograms/g wet wt; only Pb and Cu were found in high concentrations in zooplankton samples, while krill had high concentrations only in Cu.

B-49714

Ainley, D.G., Ribic, C.A., Spear, L.B., **Species-habitat relationships among antarctic seabirds: a function of physical or biological factors**, *Condor*, Nov. 1993, 95(4), p.806-816, 44 refs.

A "natural experiment" was used to evaluate the hypothesis that a major physical feature of high-latitude marine habitat, the percentage of the sea covered by pack ice, affects species composition among antarctic seabirds. The experiment entailed replicate transects through markedly altered physical habitat in the Scotia-Weddell Confluence: a series of storms caused the pack ice to advance and retreat rapidly and repeatedly over a 200 km- wide area. Regardless of where their habitat moved, pack-ice and open-water species occurred at significantly higher densities in the ice and open-water habitats, respectively. There were no time lags in the response of species to habitat alteration. In addition, pack-ice and open-water species had identical diets regardless of where their preferred habitat was located. These results supported the hypothesis and showed that physical rather than biological variables affect species composition among pelagic assemblages of antarctic seabirds. Results supported the conclu-

sion that a lack of appropriate adaptations constrains open-water species to reside away from the pack ice, and that unremarkable prey availability fails to attract pack-ice species to open waters. (Auth.)

B-49717

Thomsen, H.A., Larsen, J., **Ultrastructure of *Commation* gen. nov. (Stramenopiles Incertae Sedis), a genus of heterotrophic nanoplanktonic flagellates from antarctic waters**, *European journal of protistology*, Nov. 12, 1993, 29(4), p.462-477, 18 refs.

Commation gen. nov. is a genus of planktonic unicellular protists characterized by a circular to oval (sometimes flattened) cell body and a proboscis. Cells move predominantly by gliding. The mitochondria are tubulocristate and the two flagellar basal bodies are furnished with microtubular roots as well as a rhizoplast. The single emerging flagellum, which is rarely observed, apparently carries tripartite hairs. These features suggest that *Commation* should be listed among the genera and groups of organisms assembled in the informal group stramenopiles. Two species, *C. eposianum* sp. nov. (previously referred to as the "common-shaped amoeba") and *C. cryoporinum* sp. nov., are described from antarctic waters. The species are distinguished by differences in, e.g., the morphology of the proboscis, the complexity and details of the cytoskeleton, and the number of types of extrusomes present. *Commation* spp. appear to be ubiquitous in antarctic waters at cell abundances typically ranging from 10^3 - 10^4 cells per liter. (Auth.)

B-49718

Cassini, A., Favero, M., Albergoni, V., **Comparative studies of antioxidant enzymes in red-blooded and white-blooded antarctic teleost fish. *Pagothenia bernacchii* and *Chionodraco hamatus***, *Comparative biochemistry and physiology*, Oct. 1993, 106C(2), p.333-336, 23 refs.

Superoxide dismutase and catalase activities in livers, hearts and muscles of two antarctic fish species were examined. Significant differences between superoxide dismutase as well as catalase activities in all tissues of red-blooded and white-blooded fish were observed. Significant differences among the tissues for both antioxidant enzymes were always observed: liver has higher activity and muscle has less. The results support the theory of superoxide dismutase and catalase involvement in protecting from reactive oxygen intermediates. (Auth.)

B-49720

Gleitz, M., Thomas, D.N., **Variation in phytoplankton standing stock, chemical composition and physiology during sea-ice formation in the southeastern Weddell Sea, Antarctica**, *Journal of experimental marine biology and ecology*, Nov. 29, 1993, 173(2), p.211-230, Refs. p.227-230.

During sea-ice growth in the Weddell Sea, brine salinities gradually increased with decreasing temperatures. Nutrient concentrations in the brine of sea ice older than 2 weeks were lower than calculated from initial surface seawater values. The concomitant accumulation of phytoplankton biomass could not be explained solely by physical enrichment. The authors suggest that several microalgal species retained the capacity to assimilate nutrients and continued to grow in newly formed sea ice. However, nutrient depletions were moderate, and biochemical analyses did not indicate nutrient stress of algal metabolism. Relative abundance of smaller diatom species increased during ice growth, suggesting that pore space available for colonization in conjunction with physiological acclimation capacity were major factors determining successional patterns in recently formed sea ice. Even though ice algal assemblages apparently sustained the capacity to acclimate to reduced irradiances brought about by ice growth and increasing snow cover, maximum primary production was considerably lower than values usually reported from spring and summer ice communities. Therefore, autumnal primary production in newly formed sea ice may not add greatly to total annual production, but may provide an important food source for ice-associated grazers during the winter period, when phytoplankton biomass in the water column is extremely low. (Auth.)

B-49721

Grossmann, S., Gleitz, M., **Microbial response to experimental sea-ice formation: implications for the establishment of antarctic sea-ice communities**, *Journal of experimental marine*

biology and ecology, Nov. 29, 1993, 173(2), p.273-289, 33 refs.

The fate of algae and bacteria during the transition from open water to early stages of sea-ice formation was investigated under simulated conditions in the laboratory. Distribution patterns and metabolic activities of three common southern ocean diatoms and an antarctic bacterial community were determined after 3 and 14 days of incubation in an insulated 301 plastic vessel. Activity measurements suggest that a close coupling existed between these two groups of organisms prior to ice formation. After 3 days of freezing at -5 C, cell densities and biomasses of algae increased in pore water within an ice-pancake that formed during this period. Accumulation in the pore water exceeded the concentration effect caused by freezing out of water. Bacteria showed similar increases in the presence of algal cells during freezing. The ice-incorporated bacterial populations experienced a strong metabolic inhibition; reduced metabolic activities were also recorded for the algal species. After 2 weeks of incubation under simulated ice conditions and at salinities of 50 per mill, activity of algae and bacteria increased again. In contrast to observations made in open water prior to freezing, no influence of algal species on bacterial activity was recorded after this 2 week period. It is concluded that a bacterial community different from that of the open water had developed which needs a longer time span than employed in the present experiment to establish close metabolic coupling between algae and bacteria as recorded for microbial communities of thick pack and fast ice. (Auth. mod.)

B-49722

Kennedy, A.D., **Water as a limiting factor in the antarctic terrestrial environment: a biogeographical synthesis**, *Arctic and alpine research*, Nov. 1993, 25(4), p.308-315, 55 refs.

It is the purpose of this paper to suggest that, as a general rule, moisture underavailability should be considered of primary importance in the limitation of antarctic terrestrial life. This contrasts with the widely held belief that in a frigid environment such as Antarctica, low temperature must be the all-controlling force. Many of the limiting effects previously attributed to low temperature may in fact operate through the water balance of organisms. In Antarctica, dehydration resistance is likely to be more important than cold resistance for survival. This conclusion is particularly notable at a time when global warming and environmental change threaten to perturb the current boundaries of species limits. (Auth. mod.)

B-49726

Rokicki, J., Wägele, J.W., Strömberg, J.O., **Note on the occurrence and hosts of some parasitic antarctic isopods (Crustacea, Isopoda)**, *Polish polar research*, 1992, 13(1), p.53-57, With Polish summary. 12 refs.

Parasitic isopods (*Aega antarctica* and *Gnathia calva*) were discovered on fishes collected during Polish expeditions to the Atlantic sector of the southern ocean. Pranizae of *G. calva* infected 14.5% of *Notothenia corriceps neglecta* and 16% of *Notothenia rossi marmorata*. The infestation rates are probably underestimated. (Auth.)

B-49727

Zlotorzyska, J., Modrzejewska, M., **Contribution to the knowledge of lice (Mallophaga) from the Antarctic**, *Polish polar research*, 1992, 13(1), p.59-63, With Polish summary. 11 refs.

In material collected from birds (Aves, Procellariiformes) in the South Georgia region by Polish Antarctic Marine Research Expedition in 1976 the following mallophagan species were found: *Docophoroides brevis* (Duf.), *Naubates fuliginosus* (Tasch.), *Pseudonirmus gurlti* (Tasch.) and *Trabeculus hexacon* (Wat.). These are the first such records from this region. (Auth.)

B-49737

Iwami, T., **Fishes collected during the JARE-34 cruise in 1992-1993**, *Polar news*, Aug. 1993, No.57, p.47-51, In Japanese.

Fish specimens collected by beam- and mid trawl from the icebreaker *Shirase* in Lützow-Holm Bay, Casey Bay, and Prydz Bay during the 34th Japanese Antarctic Research Expedition, 1992-1993, are summarized. Good examples of cold adaptation were two species of white-blooded, hemoglobin-free icefish, *Chionodraco hamatus* and *Cryodraco antarcticus*. Five specimens of *Melanonus gracilis* were collected by the mid trawl at about the 1000 m depth south of 60S, but their feeding and breeding habits are still unclear. Four specimens of *Macrourus whitsoni* were col-

lected from the ocean floor of Lützow-Holm Bay, about 1800 m deep. A specimen of *Dissostichus mawsoni*, 131 cm long and weighing 26 kg was collected from a depth of about 500 m in Ongul Sound. Live photographs of *Histiodraco velifer* and *Trematomus borchgrevinki* are also included.

B-49762

Cruwys, E., Robinson, K., Davis, N.R., **Microprobe analysis of trace metals in seal teeth from Svalbard, Greenland, and South Georgia**, *Polar record*, Jan. 1994, 30(172), p.49-52, 19 refs.

Microprobe analysis has indicated that lead and strontium are present in detectable quantities in the dental tissues of seals, but that the accuracy of these results is dependent on the detection limits of the methods used. Since the detection threshold of the EDX is approximately 0.1% (1000 ppm), it is inappropriate for measuring the precise concentrations of lead and strontium in teeth, although it may give an indication as to whether they are present or not. WDX analysis can identify elements that are in concentrations on the order of .01% (100 ppm). The WDX analyses conducted in the present study suggest that the method is appropriate for measuring strontium and lead, although further research is underway to assess trace elements in these samples using ICPMS (Inductively Coupled Plasma-Emission Mass Spectrometry) and atomic absorption spectrophotometry. This will also determine the concentrations of mercury, cadmium, and vanadium in the samples. (Auth.)

B-49764

Vincent, W.F., Castenholz, R.W., Downes, M.T., Howard-Williams, C., **Antarctic cyanobacteria: light, nutrients, and photosynthesis in the microbial mat environment**, *Journal of phycology*, Dec. 1993, 29(6), p.745-755, 44 refs.

The microenvironmental and photosynthetic characteristics of antarctic microbial mats were measured in a series of ponds near McMurdo Sound. Despite large variations in mat thickness, surface morphology and color, all of the communities had a similar pigment organization, with a surface carotenoid-rich layer that overlaid a deep chlorophyll maximum (DCM) enriched in phycocyanin as well as chlorophyll *a*. Spectroradiometric analyses showed that the DCM population inhabited an orange-red shade environment. In several of the mats, the deep-living trichomes migrated up to the surface of the mat within 2 h in response to a 10-fold decrease in surface irradiance. The euphotic layer of the mats was supersaturated in oxygen and contained ammonium and dissolved reactive phosphorus concentrations in excess of 100 mg N·m⁻³ or P·m⁻³. Integral photosynthesis by core samples was saturated at low irradiances and varied two- to threefold throughout the continuous 24 h radiation cycle. Oxygen microelectrode analyses showed that the photosynthetic rates were slow to negligible near the surface and maximal in the DCM. These compressed, nutrient-rich euphotic zones have some properties analogous to planktonic systems, but the integrated photosynthetic responses of the community reflect the strong self-shading within the mat and the physiological dominance by the motile DCM populations. (Auth. mod.)

B-49769

Preyer, J.M., Oliver, J.D., **Starvation-induced thermal tolerance as a survival mechanism in a psychrophilic marine bacterium**, *Applied and environmental microbiology*, Aug. 1993, 59(8), p.2653-2656, 26 refs.

Carbon-starved cultures of strain Ant-300, a psychrophilic marine vibrio isolated from the Antarctic Convergence, were compared with their nonstarved counterparts for resistance to heat. Specifically, starved and unstarved cells were exposed to 17 C, which is 4 C above the maximum growth temperature, and compared with cells maintained at the optimum temperature (5 to 7 C). Total cell counts, direct viable-cell counts, and plate counts were monitored. At a temperature of 17 C, viability (as indicated by plate counts) was lost within 40 h, with direct viable-cell counts indicating less than 5% viability at this time. However, when cells were carbon starved for 1 week prior to heat challenge, significant plateability was maintained for more than 6 days; direct viable-cell counts of starved cells maintained at 17 C indicated the presence of viable cells for at least 12 days. Because starvation is the normal physiological state of copiotrophic, heterotrophic bacteria in oligotrophic marine waters, these data suggest that starvation conditions may be a significant factor in providing heat tolerance to psychrophiles. (Auth.)

B-49770

Miller, D.G.M., et al, **Antarctic krill aggregation characteristics from acoustic observations in the Southwest Atlantic Ocean**, *Marine biology*, Sep. 1993, 117(1), p.171-183, 45 refs.

The distribution features and physical characteristics of 4830 krill aggregations detected acoustically in the Southwest Atlantic between Jan. 26 and Feb. 21, 1981 are described. Results are compared with aggregations detected in the Indian Ocean. Aggregations in the Atlantic were larger, closer to the surface and to each other than in the Indian Ocean. Similar patterns in the distribution of aggregation spacing along survey transects were found in the two areas, although the pattern of spacings in the Atlantic indicates differences in the scale of aggregation. Serial interdependence of aggregation variables was minimal in the Atlantic, with aggregation thickness, length and spacing showing weak interrelationships. Weak functional association between water depth and aggregation thickness was evident. Investigation of variability in aggregation structure in relation to prevailing environmental conditions gave equivocal results, and no clear association between any aggregation variable and prevailing hydrography was observed. The implications of these results for future studies on krill aggregation are discussed in relation to a conceptual framework which was developed from the present results and aimed at linking krill aggregation characteristics to environmental features. (Auth.)

B-49775

Robertson, G., Williams, R., Green, K., Robertson, L., **Diet composition of Emperor penguin chicks *Aptenodytes forsteri* at two Mawson Coast colonies, Antarctica**, *Ibis*, Jan. 1994, 136(1), p.19-31, 38 refs.

In diet studies near Mawson, penguin chicks were fed a similar suite of prey species. Crustaceans occurred in 82% of stomach samples at Auster and 87% of stomachs at Taylor Glacier and were heavily digested; their contribution to food mass could not be quantified. Fish, primarily benthopelagic species, accounted for 52% by number and 55% by mass of chick diet at Auster, and squid formed the remainder. At Taylor Glacier the corresponding values were 27% by number and 31% by mass of fish and 73% by number and 69% by mass of squid. The sizes of fish varied temporally but not in a linear manner from winter to summer. Adult penguins captured fish ranging in length from 60 mm to 250 mm and squid from 19 to 280 mm in mantle length. The length-frequency distribution of squid showed seasonal variation, with the size increasing from winter to summer. The energy density of chick diet mix increased significantly prior to 'fledging'. (Auth. mod.)

B-49776

Peck, L.S., Prothero-Thomas, E., Hough, N., **Pedal mucus production by the antarctic limpet *Nacella concinna* (Strebel, 1908)**, *Journal of experimental marine biology and ecology*, Dec. 27, 1993, 174(2), p.177-192, 51 refs.

Measurements were taken over 30-min and 24-h periods to allow the relative amounts of mucus produced on attachment to substrata and during normal locomotory phases to be calculated. Mucus produced while *N. concinna* was attaching accounted for 80% of the mucus produced in a 24-h period. Rates of production were also assessed in relation to shell length, foot area and tissue ash-free dry mass (AFDM). On a foot area basis mucus production in a 24-h period ranged from 0.61 to 2.34 mg dry mass cm⁻² and was inversely related to animal size. None of the parameters accounted for a significantly larger proportion of the observed variation than any of the others. However, shell length, foot area and AFDM were all highly correlated with each other. Rates of production were also compared between specimens held in normal laboratory conditions and animals which had been starved for a 5-week period. Comparing the data with previously published estimates of food consumption showed that mucus production accounted for around 12% of the energy intake, but that this fell to 2.5% if the mucus produced on attachment was removed from the calculation. (Auth. mod.)

B-49777

Gorny, M., Brey, T., Arntz, W., Bruns, T., **Growth, development and productivity of *Chorismus antarcticus* (Pfeffer) (Crustacea: Decapoda: Natantia) in the eastern Weddell Sea, Antarctica**, *Journal of experimental marine biology and ecology*, Dec. 27, 1993, 174(2), p.261-275, 57 refs.

The antarctic shrimp *Chorismus antarcticus* is the dominant benthic shrimp species in sponge communities of the Weddell Sea shelf. Growth, mortality and productivity were estimated from trawl samples and from laboratory observations. Growth was slower and mortality was lower than in comparable boreal species. Somatic and gonad production-to-biomass ratios were estimated to be 0.587 yr^{-1} and 0.021 yr^{-1} , respectively. Within sponge communities, annual production of *C. antarcticus* amounts to about $6 \text{ mg C(org)} \cdot \text{m}^{-2} \cdot \text{yr}^{-1}$. (Auth. mod.)

B-49784

Kaup, E., **Loads and concentrations of nutrients in the lakes of the Schirmacher Oasis in the season 1983/84**, Limnological studies in Queen Maud Land (East Antarctica). Edited by J. Martin, Tallinn, Valgus, 1988, p.66-77, 13 refs.

DLC QH84.2.L56

Year-round investigations of ecological conditions and primary productivity in the lakes of the Schirmacher Oasis revealed many specific features relating to water distribution of nutrients. The Schirmacher Ponds were found to differ from other antarctic lakes by reason of their rather low nutrient concentrations under natural conditions. One to two orders of magnitude higher concentrations of phosphates and ammonium were found in waters subject to anthropogenic contamination. Data presented in this paper were obtained during the 1983-1984 season, including values for total phosphorus (suspended and dissolved), as well as those for dissolved organic phosphorus, and estimates of the total quantity of various nutrients originating from different sources.

B-49785

Kaup, E., **Primary production of phytoplankton and the content of chlorophyll *a* in the lakes of the Schirmacher Oasis during the season 1983/84**, Limnological studies in Queen Maud Land (East Antarctica). Edited by J. Martin, Tallinn, Valgus, 1988, p.78-87, 19 refs.

DLC QH84.2.L56

In 1976-77 the author carried out the first year-round investigations of fresh water lakes in Antarctica, including the Schirmacher Ponds, to determine their primary productivity and the abiotic factors affecting it. The findings show the existence of specific abiotic conditions which promote phyto-benthos but inhibit the development of phytoplankton. Those conditions are: inhibiting effects of high values of photosynthetically active radiation (PhAR) on photosynthesis (being exceedingly great with radiation in the range below 450 nm); very low temperatures of the upper water layer, immediately below the ice; and water nutrient deficiency, especially of phosphorus. Investigations carried out in the 1983-1984 season were aimed at establishing the role of extracellular primary productivity in phytoplankton metabolism, as well as to repeat earlier investigations under changed external conditions, such as intensive vertical intermixing of water layers and the disappearance of the ice cover in some of the lakes.

B-49786

Pietz, P.J., Parmelee, D.F., **Survival, site and mate fidelity in south Polar skuas *Catharacta maccormicki* at Anvers Island, Antarctica**, *Ibis*, Jan. 1994, 136(1), p.32-38, 43 refs.

In 1974-1975, 34 adult South Polar skuas were color-ringed on 18 nest territories at Bonaparte Point, Anvers I., near Palmer Station along the Antarctic Peninsula. Subsequently, the area was searched for these birds during the austral summers of 1975-1976 to 1984-1985 and in 1987-1988 and 1989-1990. Annual survival rate averaged 95% from 1974-1975 to 1984-1985; no sexual differences were detected. Strong territory and mate fidelity were apparent; 34 skuas averaged 1.1 nest territories and 1.7 mates each in 16 years. Only 4 of 34 individuals (all females) were known to change territories, and each territory change involved a change of mates. Although males showed higher territory fidelity than females, most females retained their territories when previous mates failed to return. Seventeen of 34 birds changed mates a total of 24 times; at least 20 mate changes followed the death or disappearance of the former mate. Males showed slightly higher mate fidelity than females. Female South Polar and Brown Skuas did not differ in territory or mate fidelity. From 1974-1975 to 1984-1985, 120 South Polar skua chicks were ringed on 18 nest territories on Bonaparte Point; 17 were resighted in the Palmer area when they

were 3-10 years old. All 15 returnees were found within 3 km of their natal nest sites, and four of them occupied nest territories on Bonaparte Point. (Auth. mod.)

B-49787

Prince, P.A., Rothery, P., Croxall, J.P., Wood, A.G., **Population dynamics of black-browed and grey-headed albatrosses *Diomedea melanophrys* and *D. chrysostoma* at Bird Island, South Georgia**, *Ibis*, Jan. 1994, 136(1), p.50-71, 39 refs.

Presented here are data on the size, status and dynamics of populations of Black-browed and Grey-headed albatrosses breeding at Bird I., South Georgia, following studies for 17 consecutive austral summers from 1975-1976 to 1991-1992. The focus is particularly on the comparison between species because Black-browed and Grey-headed albatrosses are, respectively, annual- and biennial-breeding species. They are otherwise very similar indeed, being almost identical in size and mass and with only relatively small differences in the timing and duration of the breeding cycle. The main aims of this study were (1) to investigate changes in breeding populations and their possible causes; (2) to determine overall breeding success (and the relative contributions of hatching and fledging success), age of first breeding, rate of recruitment of juveniles (together with an assessment of the significance of emigration from the natal colony), adult survival rates (including for males and females separately) and breeding frequency, and (3) to compare these characteristics between the annual-breeding Black-browed albatross and the biennial-breeding Grey-headed albatross. (Auth. mod.)

B-49828

Garbarino, J.A., **Secondary metabolites from antarctic lichens** [Estudio de líquenes chilenos. XIX. Investigaciones de metabolitos secundarios en líquenes antárticos], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1993, No.43, p.73-79, In Spanish with English summary. 23 refs.

Results are presented of macroextractions of secondary metabolites from 28 antarctic lichen species collected on the South Shetland Is. Structural heterogeneity and yields of 33 isolated compounds, 2 depsides and 1 tripside among them, and their relationship with photochemical aspects, are analyzed. The natural-product characteristic of ergosterol peroxide is confirmed by means of an *in situ* analysis of all samples; its high frequency is attributed to the ultraviolet radiation increase. (Auth. mod.)

B-49829

Piovano, M., et al, **Studies on Chilean lichens. 21. Secondary metabolites from the antarctic species *Hypogymnia lugubris***, *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1993, No.43, p.81-85, 17 refs.

From *Hypogymnia lugubris* (Pers.) Krog, a lichen collected in Antarctica, atranorin, ergosterol peroxide, and physodic, physodalic, protoce-traric and usnic acids were isolated. In *H. lugubris*, as well as in other antarctic species, atranorin and usnic acid coexist. These metabolites filter UV radiation which is harmful to the photobiont. The fluorescent emission of atranorin might be used in photosynthetic work, thus increasing the productivity of the species. (Auth. mod.)

B-49831

Torres N., D., Aguayo L., A., **Anthropic impact at Cape Shirreff** [Impacto antrópico en cabo Shirreff, isla Livingston, Antártica], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1993, No.43, p.93-108, In Spanish with English summary. Refs. p.106-108.

Based on literature review and field observations, a synthesis is given of evidence of human impact on Livingston I., using a chronological approach and arbitrarily establishing three periods: ancient, recent, and present. The first covers ship remains and relics of sealer encampments; the second deals primarily with the remains of a recent Russian settlement and those found on beaches (including pieces of plastic containers, fishing nets, etc.) discarded into the sea during peak years of fishing activities and brought in by the storms; and the third examines effects of human scientific activities, marine and terrestrial, from 1981 to the present. It is suggested that bodies of the Antarctic Treaty System coordinate their

protective activities in Antarctica and establish a monitoring network to survey the occurrence of plastic waste and other materials endangering the marine biota, especially in the SSSI No.32 area.

B-49840

Kärnefelt, E.I., **Place called Husvik with gigantic grasses** [En plats kallad Husvik med grös av gigantiska mått], *Svensk botanisk tidskrift*, 1993, 87(6), p.355-370, In Swedish with English summary. 25 refs.

The most common vascular plant communities in the Falkland Is. and the island of South Georgia are discussed. The field work was carried out during a major Swedish expedition to South Georgia arranged by the Swedish Polar Research Secretariat. A brief introduction is also given to earlier Swedish engagement in botanical research in this isolated part of the world. The Falkland Is. have a native flora of 163 species, while that of South Georgia comprises only 24 native species. In addition, a large number of introduced European weeds have established successfully and compete with the native element. Most taxa of the native element in both the Falkland Is. and South Georgia originate from South America. (Auth.)

B-49843

Hawes, I., Howard-Williams, C., Pridmore, R.D., **Environmental control of microbial biomass in the ponds of the McMurdo Ice Shelf, Antarctica**, *Archiv für Hydrobiologie*, 1993, 127(3), p.271-287, 21 refs.

Benthic cyanobacterial mats are the predominant form of vegetation in the many ponds on the McMurdo Ice Shelf. They attained a biomass of up to 350 mg chlorophyll *a*/m². In contrast, phytoplankton was always sparse, rarely exceeding 5 mg/m². The authors have examined a range of data from these ponds and hypothesize that low phytoplankton biomass is related to low inorganic nitrogen concentration in and loading to the ponds. Benthic biomass has accumulated over many years, in the absence of losses to sloughing or grazing, and acts as a nutrient sink. Recycling of nutrients within the benthic mats appears to have prevented return of nitrogen to the water column. The only limit to biomass of the perennial phyto-benthos may have been self-shading and the age of ponds. (Auth.)

B-49844

Nagy, K.A., Obst, B.S., **Food and energy requirements of Adélie penguins (*Pygoscelis adeliae*) on the Antarctic Peninsula**, *Physiological zoology*, Nov./Dec. 1992, 65(6), p.1271-1284, 31 refs.

Adélie penguins (mean body mass 3.81 kg) brooding small chicks had field metabolic rates (FMRs) averaging 1.64 mL CO₂ g⁻¹ h⁻¹, equivalent to 3,896 kJ d⁻¹ and 3.8 times basal metabolic rate (BMR). Energy utilization while on the nest was 2.0 x BMR, and it was 5.4 x BMR when off the nest, including time spent foraging at sea. These FMRs are higher than in other species of penguins and may reflect an intense foraging effort associated with a relative scarcity of food during this study. The penguins ate only krill, primarily juveniles of intermediate size, which contain much water, little lipid, and relatively low metabolizable energy content compared to gravid female krill. Low water intake rates indicated that the penguins did not drink much fresh water or seawater and that they did not consume quite enough food to pay their own energy expenses after feeding their chicks. Their utilization of body fat to pay the difference should have amounted to about 33 g/d during this phase of the breeding cycle. It is estimated that the 25,500 Adélie penguins using the Arthur Harbor area around Palmer Station would consume about 27.5 metric tons of krill each day. Six hundred twelve penguins (total biomass of 2,330 kg) would consume about the same amount of krill per day as does one antarctic fin whale weighing 48,000 kg. (Auth.)

B-49845

Franklin, C.E., McKenzie, J.C., Davison, W., Carey, P.W., **X-cell gill disease obliterates the lamellar blood supply in the antarctic teleost, *Pagothenia borchgrevinki* (Boulenger 1902)**, *Journal of fish diseases*, 1993, 16(3), p.249-254, 11 refs.

Vascular corrosion casting methods were used to elucidate the pathological effects of X-cell disease on the blood supply to the gills of the antarctic teleost *Pagothenia borchgrevinki* (Boulenger, 1902). Afferent and efferent branchial arteries were patent in X-cell diseased fish; however, the blood supply to the lamellae was markedly reduced or obliterated in areas

in which there was a predominance of X-cells. The authors believe that the tissue hyperplasia associated with X-cell disease results in compression of the lamellar vascular bed which leads eventually to the occlusion of vessels. (Auth.)

B-49846

Austin, F.J., Webster, R.G., **Evidence of ortho- and paramyxoviruses in fauna from Antarctica**, *Journal of wildlife diseases*, Oct. 1993, 29(4), p.568-571, 22 refs.

Serum antibodies to influenza A viruses and paramyxoviruses were detected in Adélie penguin (*Pysoscelis adeliae*) and antarctic skua (*Stercorarius skua maccormicki*) sera in the Ross Sea Dependency. An avian paramyxovirus was isolated from a penguin cloacal swab. (Auth.)

B-49847

Maffia, M., et al, **Adaptation of intestinal cell membrane enzymes to low temperatures in the antarctic teleost *Pagothenia bernacchii***, *Journal of comparative physiology, B*, 1993, 163(4), p.265-270, 22 refs.

The enzymatic activity of three intestinal brush-border membrane enzymes, leucine aminopeptidase, alkaline phosphatase and maltase, measured over a range of temperatures between 1.5 and 37 C, is much higher in the antarctic fish *Pagothenia bernacchii* than in the temperate fish *Anguilla anguilla*. To explain this experimental observation, the authors researched the apparent Michaelis-Menton constant, the maximal velocity, the activation energy values, and the thermal stability of these three enzymes. The apparent Michaelis-Menton constant values of leucine aminopeptidase and alkaline phosphatase were different in the intestine mucosal homogenate of the two fish at each measured temperature. However, the values found at 2.5 C for the antarctic species and at 15 C for the eel were comparable. The impairment of alkaline phosphatase maximal activity cannot be significantly differentiated from a non-specific inhibitory effect of the detergent. The activation energy values of leucine aminopeptidase, alkaline phosphatase and maltase were lower in the antarctic fish than in the eel. -The thermal stability of alkaline phosphatase and maltase is different in the intestinal homogenate of both species. (Auth. mod.)

B-49848

Morgan, K.R., Chappell, M.A., Bucher, T.L., **Ventilatory oxygen extraction in relation to ambient temperature in four antarctic seabirds**, *Physiological zoology*, Nov./Dec. 1992, 65(6), p.1092-1113, 24 refs.

The hypothesis is presented that at low ambient temperatures birds reduce ventilatory heat loss by increasing ventilatory oxygen consumption. Relationships between several biochemical factors as they functioned in four species of seabirds were examined: body temperature, oxygen consumption, carbon dioxide production, evaporative water loss, respiratory frequency, tidal volume, minute volume, and ventilatory oxygen extraction. The four marine seabirds were kelp gulls, giant petrels, storm petrels, and skuas. The numerous variations which occurred in these factors as bird sizes and body temperatures changed suggests that increasing the ventilatory oxygen extraction as a means of reducing ventilatory heat loss is not a general phenomenon in cold-adapted birds. (Auth. mod.)

B-49858

Kantor, W., **Environmental impact analysis of the German Gondwana Station, Antarctica, and mapping of the substrate, flora and fauna**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.7-37, With German and Russian summaries. 14 refs.

An environmental impact analysis of the German Gondwana Station was carried out during the GANOVEX V expedition. The objective of this study was to quantify the impact of human activities at the station on the ecosystem at the site. For this purpose, a detailed sediment/soil map of the station site was compiled and the distribution of lichens and mosses on the site and the breeding places of the antarctic skua were mapped. The locations of new station facilities, which were to be established on areas with no vegetation, were then selected on the basis of the distribution map of lichens and mosses. Areas of vegetation and skua breeding grounds were declared to be protected zones. (Auth. mod.)

B-49878

Bartsch, I., **Two new species of the genus *Bradyagaue* (Halacaroidea, Acari) from the southern Indian Ocean**, *Cahiers de biologie marine*, 1992, 33(4), p.433-440, 4 refs.

Two new arachnid species, *Bradyagaue crozetis* n.sp. and *B. scutella* n.sp., are described. *B. crozetis* was taken off the Crozet Is.; the specimens were found clinging to stolons of hydroids. *B. scutella* was collected in southwestern Australia; it is generally found on the seagrass *Amphibolis antarctica*, on leaves with a dense epiflora and epifauna. (Auth.)

B-49879

Moyano G., H.I., et al, **Chilean marine Bryozoa 8: zoogeography and description of new species and genera** [Bryozoa marinos chilenos VIII: una síntesis zoogeográfica con consideraciones sistemáticas y la descripción de diez especies y dos géneros nuevos], *Gayana (Zoología)*, 1991, 55(4), p.305-389, In Spanish with English summary. Refs. passim.

This study consists of 5 parts: the main part, which is strictly zoogeographic, and 4 addenda which deal with descriptions of taxa, faunal additions and taxonomic discussions. The zoogeographic part includes a taxonomic list containing more than 470 bryozoan species from the South American, antarctic and oceanic Chilean territories. In the final discussion, a global analysis is carried out using all 470 species. The Kulczynsky-2 and Czekanowsky similitude indexes were used to make the zoogeographic comparisons, with results converted into a matrix and dendrograms. On the basis of the results, the following zoogeographic provinces are proposed: Antarctic, Magellanic, Chilean, Juan Fernandez, Easter Island, and Southeastern Pacific Bathyal.

B-49880

Liggins, G.C., et al, **Concentrations, metabolic clearance rates, production rates and plasma binding of cortisol in antarctic phocid seals**, *Acta endocrinologica*, Oct. 1993, 129(4), p.356-359, 17 refs.

The present study was undertaken to determine whether high cortisol levels were common to seals in the antarctic environment or to other phocidae, and to determine the mechanism of the hypercortisolaemia. High levels of cortisol were found in 4 phocidae (Weddell, crabeater, leopard and Southern elephant seals), whereas levels in a member of the otariid family (antarctic fur seal) were similar to human values. The binding capacity of corticosteroid-binding globulin (CBG) was equal to or greater than the plasma concentrations of cortisol, resulting in relatively low concentrations of free cortisol. It is concluded that hypercortisolaemia is maintained in phocid seals mainly by a high production rate—the highest (corrected for surface area) reported in any species. The relatively low cortisol levels in otariid seals studied in the same environment suggest that the high PR in phocidae is unrelated to the harsh climatic conditions, but may be part of their adaptation for diving to extreme depths. (Auth. mod.)

B-49892

Szefer, P., Czarnowski, W., Pempkowiak, J., Holm, E., **Mercury and major essential elements in seals, penguins, and other representative fauna of the Antarctic**, *Archives of environmental contamination and toxicology*, Nov. 1993, 25(4), p.422-427, Refs. p.426-427.

Concentrations of total Hg and the major essential elements Ca, Mg, Na, and K were measured in the muscle, liver, and kidney of three species of seals: crabeater seal, leopard seal and Weddell seal collected in the Antarctic. The muscle and liver of three species of penguins (Gentoo, Adélie, chinstrap) and other representative fauna were also analyzed for the elements. Distinct inter-tissue differences in the metal concentration were observed; liver had the greatest concentrations of Hg, kidney showed maximum concentration of Ca and Na, while muscle was characterized by the greatest content of Mg and K. Inter-specimen differentiation of concentrations among the same species was distinctly visualized for Hg but not for the major essential elements. The Hg concentration in the seals analyzed are in keeping with those reported previously by other authors. Numerous significant correlations were observed between concentrations of the several metals analyzed. There was no correlation between Hg, which is a non-essential element, and either Zn or Cd, which are essential and non-essential elements, respectively, in the liver or kidney of seals. However, there were significant correlations between concentration of Zn and the

sum of molar concentrations of Hg + Cd in kidney ($r=0.82$) and liver ($r=0.76$). The results suggest that several control mechanisms operate to maintain physiologically required levels, which decreases any effect of heavy metal toxicants such as Hg and Cd. (Auth. mod.)

B-49893

Szefer, P., et al, **Distribution and coassociations of selected metals in seals of the Antarctic**, *Environmental pollution*, 1994 (Pub. 1993), 83(3), p.341-349, Refs. p.348-349.

Zinc, Cu, Cd, Pb, Ag, Ni, Co, Cr, Fe and Mn concentrations in some tissues of crabeater seal (*Lobodon carcinophagus*), leopard seal (*Hydrurga leptonyx*) and Weddell seal (*Leptonychotes weddelli*) from the Antarctic were determined. Distinct inter-tissue differences in metal concentrations in seals were observed; liver contained maximum levels of Zn, Cu, Ag and Mn, whilst kidney showed the highest levels of Cd, Ni and Co. Muscle was characterized by low concentrations of all the elements analyzed. The metal concentrations in the vertebrates analyzed were compared with those for organisms originating from various aquatic areas. Significant correlations were found between the levels of several of the metals analyzed, e.g. between renal and hepatic concentrations of Zn and Cd. Strong relationships between the hepatic concentrations of some metals were found, e.g. Cd-Zn. These two metals also showed a significant coassociation in their renal concentrations. The slope of the regression line for renal Cd/Zn was about three times higher than the hepatic one. This may reflect a relatively high Cd exposure, probably from specific food (squid and krill) provenance, of the seals analyzed. (Auth.)

B-49896

Janssen, J., Jones, W., Slattery, M., **Locomotion and feeding responses to mechanical stimuli in *Histiadraco velifer* (Arteidraconidae)**, *Copeia*, Aug. 18, 1993, No.3, p.885-889, 8 refs.

Most shelf-dwelling antarctic fishes belong to the perciform suborder Notothenioidae and have radiated to occupy a variety of trophic and habitat niches. One family, the Arteidraconidae, is distinguished by a median mandibular barbel which may function either as an organ of taste (as in catfishes) or as a lure (as in certain stomiatoids). The authors present behavioral and morphological evidence that in *Histiadraco velifer* the mental barbel functions as a lure. In addition, observations on its locomotion suggest that *H. velifer* behavior is convergent with that of frogfishes (Antennariidae). This fish is very uncommon in McMurdo Sound, where the specimen was caught. (Auth. mod.)

B-49920

Odate, T., Harada, N., Fukuchi, M., **Comparisons of N,N-dimethylformamide and 90% acetone as an extraction solvent for fluorometric determination of chlorophyll *a* from natural phytoplankton communities in the southern ocean**, *Antarctic record*, Nov. 1993, 37(3), p.260-264, 9 refs.

Algal chlorophyllous pigments were extracted with two different solvents, N,N-dimethylformamide (DMF) and 90% acetone, using natural phytoplankton communities in the southern ocean. Concentrations of chlorophyll *a* and phaeopigments were determined fluorometrically. Statistical analyses showed that chlorophyll *a* concentrations were equivalent, although the solvents were different. No significant difference was observed between concentrations of phaeopigments extracted with the different solvents. The correlation coefficient obtained between phaeopigment concentrations was significantly lower than that between chlorophyll *a* concentrations. Phaeopigment concentrations extracted with DMF tended to be higher than those with 90% acetone. Total chlorophyllous pigments (chlorophyll *a* plus phaeopigments) were about 10% higher in the former solvent than in the latter, considering the slope of the regression line ($=1.088$). (Auth. mod.)

B-49933

Baroni, C., Orombelli, G., **Abandoned penguin rookeries as Holocene paleoclimatic indicators in Antarctica**, *Geology*, Jan. 1994, 22(1), p.23-26, 27 refs.

Penguins are sensitive indicators of the antarctic climate and of the environmental parameters that limit their presence and distribution. Paleoenvironmental data obtained from the study of abandoned Adélie penguin rookeries along the Victoria Land coast indicate a ^{14}C date of 11-13 ka for the oldest abandoned rookery and supply new information about the

timing of glacier retreat in southern Victoria Land after the last glacial maximum. The continuous presence of the Adélie penguins is documented from 7 ka. The limiting factors that control the presence of penguins along the coast of Victoria Land changed during the Holocene. While several colonies were occupied for very long periods, other sites were used for more or less extended periods and then abandoned. The greatest diffusion of rookeries occurred between 3 and 4 ka, a period of particularly favorable environmental conditions that has never been repeated. It was followed by a sudden decrease in the number of penguin rookeries shortly after 3 ka. This event has been attributed to an increase of the sea-ice extension and may have been correlated to a worldwide phase of climate change near the Subboreal-Subantarctic boundary. A minor phase of penguin reoccupation occurred locally in the 8th to 14th centuries A.D. (Auth. mod.)

B-49939

Pugh, P.J.A., Bartsch, I., **Ecology of the littoral Halacaridae (Acari: Prostigmata) of South Georgia in the sub-Antarctic**, *Journal of natural history*, Jan./Feb. 1994, 28(1), p.75-85, 34 refs.

DLC SPRI Pam 595.42 : (*723)

Nine species of marine littoral Halacaridae were collected from Husvik Harbour, South Georgia, all of which are new to the fauna of the island. These include *Isobactrus microdens* Newell, *Rhombognathus auster* Bartsch, *R. multisetosus* Newell, *R. plumifer* Trouessart, *Agauopsis inflatus* Newell, *Halacarellus novellus* Bartsch and Pugh, *H. porellus* Bartsch and Pugh, *Lohmannella bihamata* Viets and *L. grandipora* Newell. The halacarid fauna is similar to that of southern South America, though depauperate and dominated by a single species, *R. auster*, which was found in large numbers and at all levels of the littoral zone. Low diversity probably results from isolation and/or severe climatic factors. Isolation results from lack of suitable habitable shores and the remoteness of South Georgia itself. The main climatic limitation is exposure to freezing air and icing during winter non-submergent neap tides. (Auth.)

B-49940

Hayward, P.J., Winston, J.E., **New species of cheilostomate Bryozoa collected by the US Antarctic Research Program**, *Journal of natural history*, Jan./Feb. 1994, 28(1), p.237-246, 15 refs.

Four new species of cheilostomate Bryozoa are described in the genera *Chartella*, *Ogivalia*, *Melicerita* and *Cellarinella*. The circumarctic genus *Chartella* is recorded for the first time from the subantarctic. *Alloeoflustra* gen. nov. is introduced for three endemic antarctic Flustridae. (Auth.)

B-49943

Feldmann, R.M., ***Antarctomithrax thompsoni*, a new genus and species of crab (Brachyura; Majidae) from the La Meseta formation (Eocene) of Seymour Island, Antarctica**, *Journal of paleontology*, Jan. 1994, 68(1), p.174-176, 8 refs.

The James Ross Basin has yielded an extensive fauna of decapod crustaceans spanning Late Cretaceous through Eocene time. To date, 28 species in 22 genera and 18 families have been described, making this the most diverse fossil decapod fauna in the Southern Hemisphere. Within the basin, Seymour I. alone contains rocks of the Eocene age La Meseta Formation from which seven species of crabs, one galatheid, and one species of callinassid ghost shrimp have been described. The fauna of the La Meseta is remarkable also because, although the organisms are preserved in rocks deposited in moderate- to high-energy shallow-water habitats, many of the species represent early occurrences of taxa with living descendants that are characteristic of deeper water, lower latitude habitats. The purpose of this note is to report a new genus and species of spider crab (family Majidae) from the lower part of the La Meseta Formation. This discovery represents the second fossil majid to be described from Antarctica. (Auth. mod.)

B-49945

Long, D.J., Waggoner, B.M., **Ectoparasitic barnacle *Anelasma* (Cirripedia, Thoracica, Lepadomorpha) on the shark *Centroscyllium nigrum* (Chondrichthyes, Squalidae) from the Pacific sub-Antarctic**, *Systematic parasitology*, Oct. 1993, 26(2), p.133-136, 14 refs.

The occurrence is reported of the ectoparasitic lepadomorph barnacle *Anelasma* sp. on the deep-sea squaloid shark *Centroscyllium nigrum* from the Pacific sub-antarctic off southern Chile. *Anelasma* has previously been documented only from the northeast Atlantic on the squaloid shark *Etmopterus spinax*; this new record extends the known range of *Anelasma* into the Pacific Ocean and the Southern Hemisphere, and documents a new host for this parasitic barnacle. (Auth.)

B-49950

Laws, R.M., ed, **Antarctic seals, research methods and techniques**, Cambridge, University Press, 1993, 390p., Refs. passim. For individual papers see B-49951 through B-49966.

DLC QL737.P64A57

This book, arising from work by the Scientific Committee on Antarctic Research (Group of Specialists on Seals), gives—in 15 chapters and 7 appendices—a detailed account of well-tried and, where possible, agreed methodologies, techniques, procedures and rationale for the collection and initial analysis of data on the biology and population ecology of antarctic seals.

B-49951

Laws, R.M., **Introduction**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.xiii-xxii, 8 refs.

DLC QL737.P64A57

In this introductory chapter to "Antarctic seals, research methods and techniques", the structure and function of SCAR—and those of the Working Groups and Groups of Specialists created by SCAR—are described. The 15 chapters of this publication, arising as a result of the activities of the SCAR Group of Specialists on Seals, are briefly reviewed.

B-49952

Laws, R.M., **Identification of species**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.1-28, 11 refs.

DLC QL737.P64A57

In this chapter, advice is given on the field identification of seven species of seals: the southern elephant *Mirounga leonina*; Weddell seal, *Lep- tonychotes weddellii*; Ross seal, *Ommatophoca rossii*; crabeater seal, *Lobodon carcinophagus*; leopard seal, *Hydrurga leptonyx*; antarctic fur seal, *Arctocephalus gazella*; and the subantarctic fur seal, *Arctocephalus tropicalis*. From the information and illustrations given, remote identification of adults should be possible; other information is provided to enable confirmation of the species in doubtful cases, if a closer approach is possible, if the animal is dead, or if only a skeleton or skull is found.

B-49953

Erickson, A.W., Siniff, D.B., Harwood, J., **Estimation of population sizes**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.29-45, Refs. p.44-45.

DLC QL737.P64A57

This chapter provides a review of the methods which are currently available for estimating the size of antarctic seal populations. Such estimates have many potential uses, ranging from the evaluation of the status of a species as part of a management or conservation plan, to the use of the species' abundance as an indicator of prey availability. However, there is no one estimation technique which is suitable for all purposes. Ground, ship-based and aerial counting methods and population estimation are different for land-breeding and ice-breeding species. Mark-recapture techniques are described. Methods of extrapolating from density estimates to total population size are also treated, taking account of practical considerations relating to the polar environment.

B-49954

Erickson, A.W., Bester, M.N., **Immobilization and capture**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.46-88, Refs. p.85-88.

DLC QL737.P64A57

For a number of purposes connected with research it may be necessary to restrain or immobilize a seal, and this is dealt with in this chapter. The categories of drugs available and the best methods of administering them are described, with special reference to both southern phocid seals and the fur seals. Other methods of capture, such as the use of a restraining sack, may be adequate or appropriate for certain studies and are described.

B-49955

Erickson, A.W., Bester, M.N., Laws, R.M., **Marking techniques**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.89-118, Refs. p.114-118.

DLC QL737.P64A57

This chapter deals with marking techniques and programs, including branding (hot-iron, freeze and explosive), punching and tattooing, tagging with plastic and metal tags, vital staining to establish rate of deposition of layers in teeth, the use of natural marks, paint, dyes and hair clipping to identify individuals. Some recommendations are made for standardizing numerical marking. A central seal tagging database is maintained through the Group of Specialists.

B-49956

Bengtson, J.L., **Telemetry and electronic technology**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.119-139, Refs. p.135-138.

DLC QL737.P64A57

Rapid advances in the field of electronics in recent years, in particular the miniaturization of solid state circuitry through semiconductor technology, has made it feasible to deploy highly sophisticated instruments on free-ranging animals. This chapter briefly outlines the types of instruments deployed in pinniped research. The main categories of instrument described are radio telemetry (transmitters, receivers and recorders), sonic devices (recording vocalizations, sonic transducers and transponders), self-contained recorders (time-depth recorders, gastro-thermo recorders, geolocation by daily light levels, satellite linkage and transmission). A section on attachment methods is also included, covering harnesses, bracelets, glues and epoxy resins.

B-49957

Stirling, I., Gentry, R.L., McCann, T.S., **Behaviour**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.140-154, Refs. p.151-154.

DLC QL737.P64A57

On a superficial level most seal behavior seems straightforward, but recording behavioral observations for scientific use can be deceptively difficult. The object of this chapter is to provide some guidelines on the kinds of data that are important, and the methods that can be used. Of necessity, this discussion is oriented towards recording the terrestrial behavior of seals; recording behavior at sea requires special instrumentation and is discussed elsewhere. The authors begin by describing briefly how to quantify behavior and then discuss in more detail some of the categories of behavioral observation that are applicable to population ecology, the biology of species, and to defining taxonomic affinities. For each category the types of observations to be made are described, along with the species or situations to which they apply. Specific applications of behavioral knowledge are discussed, and references for further study are given.

B-49958

Bonner, W.N., **Killing methods**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.155-160, 9 refs.

DLC QL737.P64A57

For some research studies seals have to be killed, and one of the terms of reference of the SCAR Group of Specialists on seals was to make recommendations with a view to ensuring that the killing or capturing of seals by sealing expeditions or by research workers is quick, painless and efficient. This chapter gives recommended methods of shooting, chemical euthanasia and clubbing.

B-49959

Bonner, W.N., Laws, R.M., **Morphometrics, specimen collec-**

tion and preservation, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.161-171, 10 refs.

DLC QL737.P64A57

Four basic collection needs most relevant to seal population ecology in research and management are described. The fundamental data to be recorded for each specimen include the recommended basic measurements and weights, the basic material to be collected and the recommended preservatives. The need to minimize the risk of infection (such as 'seal finger') is emphasized. Detailed instructions are given for collecting material for age determination (teeth and toenails) which is fundamental to most studies. Priorities and methods of collection for skeletal material are recommended (skull, skeleton and baculum). Priority for collecting reproductive specimens is given to female material because it contributes more to the understanding of essential population parameters such as pregnancy rates and age at first reproduction.

B-49960

Shaughnessy, P.D., Hofman, R.J., Dowling, T.E., Brown, W.M., **Genetic-based studies for stock separation**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.172-193, Refs. p.188-193.

DLC QL737.P64A57

This chapter is concerned with genetic-based studies which contribute to meeting the basic need of distinguishing between seal populations. Both in terms of basic population biology and for management studies it is desirable or essential to establish the unity and integrity of the stocks concerned. Sample size and related considerations are discussed, and an outline of methods of collecting and preparing blood, plasma and serum samples is given. Gel electrophoresis techniques are referenced. The analysis of polymorphic data is considered and an expression to estimate the genetic similarity of two populations is given.

B-49961

Shaughnessy, P.D., **Collection of material for the determination of organochlorine and heavy metal levels**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.194-198, 24 refs.

DLC QL737.P64A57

With the increasing concern about pollutants in the environment and the demonstration of accumulation of such substances in the tissues of antarctic animals, opportunity may be taken to collect samples for determination of pollutant levels, when seals are killed for other reasons. The contaminants include organochlorine residues and heavy metals; recommendations for collecting and preserving samples are given in this chapter.

B-49962

McCann, T.S., **Age determination**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.199-227, Refs. p.224-227.

DLC QL737.P64A57

Age determination is a basic tool in population biology research on mammals, particularly in studies of body growth rates, age-specific reproductive rates and other aspects of population dynamics. This chapter on age determination of seals concentrates on the best proven method, depending on incremental lines in the teeth. The tooth structure and methods of preparing sections for examination are described, with literature references. There is a need to reduce confusion and ambiguity, particularly in relation to complex dentine structures; cementum has a much simpler structure. Aspects covered include: collection and storage, use of external and internal structures (direct sectioning, etching, decalcification and staining). Because of its importance, a recommended methodology for preparation and reading is given for each species. The methods are not without error, and reliability and validation are specifically addressed.

B-49963

Laws, R.M., Sinha, A.A., **Reproduction**, Antarctic seals, research methods and techniques. Edited by R.M. Laws, Cambridge, University Press, 1993, p.228-267, Refs. p.262-264.

DLC QL737.P64A57

The complex social behavior shown by many seals is interpretable only in the light of the reproductive status of the animals concerned. An understanding of seal population dynamics can be reached only if the reproductive success of the members of the population is known; population changes can be monitored by observing changes in the mean age of puberty. This chapter first provides an introduction to the reproductive cycle and the organs of reproduction, and then describes some methods for studying fetal growth, estimating pregnancy rate and observations of birth and lactation. A method of establishing paternity by DNA fingerprinting is described. Puberty and sexual maturity are defined and a method is described for calculating the mean age at sexual maturity. Finally, some additional field techniques and basic methods of analysis are described.

B-49964

Croxall, J.P., **Diet, Antarctic seals, research methods and techniques.** Edited by R.M. Laws, Cambridge, University Press, 1993, p.268-290, Refs. p.286-290.

DLC QL737.P64A57

Estimation of food consumption is a very important aspect of antarctic seal studies because of the history of perturbations and interactions in the southern ocean ecosystem. This chapter recommends methods of obtaining, recording and preserving material suitable for these studies, from complete stomachs and intestines of killed seals, partial samples from stomachs of live seals, and the collection of fecal droppings or regurgitations. Recommended methods of sorting and identification of food samples (including fragmentary material such as eyes, otoliths and beaks of crustaceans, fish and squid) are given with appropriate literature references. Biochemical techniques have also been used for very detailed studies. Finally, the problems and biases likely to be encountered in quantifying and interpreting the results of these studies, and ways of compensating for them, are outlined. An index of relative importance (IRI) and a modified volume index (MVI), which are useful compromises, are described and compared.

B-49965

Anderson, S.S., Costa, D., Fedak, M.A., **Bioenergetics, Antarctic seals, research methods and techniques.** Edited by R.M. Laws, Cambridge, University Press, 1993, p.291-315, Refs. p.311-315.

DLC QL737.P64A57

In this chapter, the authors list some of the questions that might be asked in bioenergetic studies of seals and to cover in detail the techniques which can be used to address them. These techniques fall into 3 main categories: changes in the weight and composition of the body over time, changes in the rate at which substances turn over within the body, and direct measurements of the oxygen consumed and carbon dioxide produced by aerobic metabolism. Additional techniques are described in the section 'Measurement of correlates of energy expenditure' which are supplementary to the main methods. They are concerned with correlates of energy expenditure which can be used as substitutes for direct measurements when these are inappropriate or impossible to make. They can also be important in furthering understanding of how and why animals use energy in various ways. The limitations of the methods described are discussed.

B-49966

Laws, R.M., **Development of technology and research needs, Antarctic seals, research methods and techniques.** Edited by R.M. Laws, Cambridge, University Press, 1993, p.316-335, 14 refs.

DLC QL737.P64A57

This chapter is concerned with the development of techniques for pinniped research. The objectives and the types of research programs needed to meet them are outlined. They relate both to improved understanding of the basic biology of seals and to meeting the perceived needs of two international conventions within the Antarctic Treaty System, on the conservation of seals and other elements in antarctic marine ecosystems. The suggested research programs are broadly framed so as to indicate where methodology and techniques particularly need to be improved.

B-49967

Winkler, H., Brandt, A., **Janiridae (Crustacea, Asellota) from the Southern Hemisphere: *Ianiropsis varians* sp.n. and redescription of five little-known species, *Zoologica scripta*, Oct.**

1993, 22(4), p.387-424, 24 refs.

Ianiropsis varians sp.n. is described, and it is shown that dorsal pigment patterns of this species vary widely within a single population. The janirid species *Austrofilus furcatus* Hodgson, 1910, *A. serratus* Vanhöffen, 1904, *Neojaera antarctica* (Pfeffer, 1887), *Notasellus chilensis* (Menzies, 1962), and *N. sarsii* Pfeffer 1887 are redescribed. Additionally, sexual dimorphisms of maxilliped, pereopods, and pleopod 3 observed in some janirid species are discussed.

B-49970

Mercantini, R., Marsella, R., Moretto, D., Finotti, E., **Keratinophilic fungi in the antarctic environment, *Mycopathologia*, June 1993, 122(3), p.169-175, 12 refs.**

Results of a study on the diffusion of keratinophilic fungi in an antarctic environment are given. Nine soil samples collected from as many sites along the coast of Ross Sea, and 6 dust samples from the Terra Nova Bay Station were examined by direct inoculation and hair baiting methods for soil samples and plate dilution method for dust samples. As regards the variety of species isolated and the counting of the numbers of colonies, the plate dilution method proved to be very effective. *Aspergillus* spp., *Cladosporium* sp., *Dematiaceae*, *Fusarium* sp., *Geomyces pannorum* v. *pannorum*, *G. pannorum* v. *vinaceus*, *Mycelia sterilia*, and *Penicillium* spp. were isolated from soil. From the dust the following molds were isolated: *Aphanoascus fulvescens*, *Aspergillus* sp., *Beauveria* sp., *Chrysosporium carmichaelii*, *Dematiaceae*, *Geomyces pannorum* v. *pannorum*, *G. pannorum* v. *vinaceus*, *Malbranchea gypsea*, *Mycelia sterilia*, *Nectria inventa*, *Penicillium* spp., *Scopulariopsis brevicaulis*, *Scopulariopsis* sp. and *Trichophyton mentagrophytes*. The presence of 4 colonies of *T. mentagrophytes* is emphasized and correlated with the anthropization process. (Auth.)

B-49972

Emschermann, P., **Lime-twig glands: a unique invention of an antarctic entoproct, *Biological bulletin*, Aug. 1993, 185(1), p.97-108, 17 refs.**

Specialized glands that release formed secretions of a complex structure are known from several invertebrate phyla. A novel type of such an extrusive organ has been detected in the newly described antarctic entoproct *Loxosomella brochobola* Emschermann, 1993 and is reported here. The specialized extrusive organs known from other invertebrates are generally unicellular, but these entoproctan glands are multicellular organs. The structured secretion of these glands is an extracellular product homologous to the body cuticle and is discharged in long sticky, hollow threads. In evolutionary convergence to the glutinant spirocysts of the Anthozoa, these threads are assumed—like set out single lime-twigs—to trap larger prey organisms inaccessible to the ciliary feeding current of the entoproct. Specialized glands of this kind have not been known previously in Entoprocta. This "invention" by a nanoplankton feeder must be seen as a specific adaptation to life in an environment that is poor in nanoplankton. *L. brochobola* was found exclusively on the inner abfrontal surface of the tube-shaped calcareous colonies of the bryozoan *Porella malouinensis*, and shares this microhabitat only with some smaller predators, such as the hydrozoan *Halecium* sp.; no other ciliary feeders are present. (Auth.)

B-49978

Chappell, M.A., et al, **Energetics of foraging in breeding Adélie penguins, *Ecology*, Dec. 1993, 74(8), p.2450-2461, Refs. p.2460-2461.**

Foraging energetics were studied in Adélie penguins using doubly labeled water (DLW) and time-dependent recorders (TDR). Measurements were made during 3 nesting stages: late incubation, the guard stage (when small chicks were continuously guarded by at least one parent), and the subsequent creche stage (when large chicks were left unattended). Nest relief cycle times decreased from 229 h during incubation to 33.3 h during the creche stage, and the fraction of time birds spent swimming increased from 20.8% during incubation to 31.6% during the creche stage. The fraction of swim time spent in hunting dives and bottom time did not change significantly at different nesting stages. Rates of prey capture (grams of krill per hour of swimming, per hour of hunting dives, and per hour of bottom time) did not change at different stages. Food provided to chicks was 20.9% (guard stage) to 23.3% (creche stage) of the food metabolized by adults. Results suggest that prey capture by Adélies is limited primarily by their ability to find krill swarms and not by limitations in

harvest rates or energy efficiency after prey have been located, and reproductive effort in Adélies does not require a large increase in either energy expenditures or foraging time. (Auth. mod.)

B-49979

Wasik, A., Mikolajczyk, E., **Annual cycle of tintinnids in Admiralty Bay with an emphasis on seasonal variability in *Cymatocylis affinis/convallaria* lorica morphology**, *Journal of plankton research*, Jan. 1994, 16(1), p.1-8, 34 refs.

In water samples collected from the middle of Admiralty Bay between Feb. 1990 and Jan. 1991, 17 *Tintinnina* species were noted. Total numbers in summer were very high (up to 5000 cells/m³), but species diversity was low, consisting mainly of *Cymatocylis affinis/convallaria*, forma *convallaria*. During austral winter, cell numbers were very low, but species composition was diverse. *Cymatocylis affinis/convallaria*, forma *affinis*, and *C. affinis/convallaria*, forma *convallaria*, the polymorphic forms of one species *C. affinis/convallaria*, appears to be interchangeable during the year. The transition from one form to the other occurs in the spring and autumn. The typical *Tintinnina* polymorphism can be attributed to the prevailing environmental conditions. (Auth.)

B-49980

Ferrari, F.D., **Ecology of *Metridia gerlachei* Giesbrecht in the western Bransfield Strait, Antarctica—Comment**, *Deep-sea research*, Aug. 1993, 40(8), p.1711-1712, 8 refs. For article being commented on see 21B-48505.

In a recent article about the ecology of *Metridia gerlachei*, Huntley and Excirotor (1992; pp.1028-1029) state "As in all species of *Metridia*, early stage (CI-CIII) and male and female CVI copepodites are easily identified on the basis of gross morphology (i.e. the numbers of pleopods and urosomal segments), but CIV and CV copepodites are indistinguishable in this regard (Ottestad, 1936)". The author finds this statement to be incorrect, because all copepodid stages of metridinid copepods can be separated by counting the number of somites (body segments) and the number of ramal segments of thoracopods 2-5 (swimming legs 1-4).

B-49981

Williams, T.D., Sharp, P.J., **Plasma prolactin during the breeding season in adult and immature Macaroni (*Eudyptes chrysolophus*) and Gentoo (*Pygoscelis papua*) penguins**, *General and comparative endocrinology*, Dec. 1993, 92(3), p.339-346, Refs. p.345-346.

Plasma prolactin levels were measured in free-living breeding adult and immature Macaroni and Gentoo penguins at Bird I. Macaroni and Gentoo penguins first breed at 5-6 and 2 years of age, respectively. In adult birds of both species, prolactin was low (<1.0 micrograms/l) during the courtship period and then increased during early (Gentoo) to mid (Macaroni) incubation, remaining elevated until the creche period, by which time continuous nest attendance by the adults had ceased. This pattern is similar to that seen in other altricial species and is consistent with delayed onset of brood patch development and full incubation efficiency, as previously reported in penguins. Adult female Macaroni penguins showed a marked but transient increase in prolactin concentrations within 24 hr of the first egg being laid, with plasma levels decreasing following clutch completion (to prelaying levels) before increasing again during incubation. Elevated plasma prolactin levels occurred in all age classes of immature (nonbreeding) birds in both Macaroni (1-5 year-olds) and Gentoo (1-year-olds) penguins. It is suggested that variation in the pattern of prolactin secretion in immature birds represents real age-related or species-related differences and does not simply reflect differences in the previous photoperiodic environment experienced. (Auth. mod.)

B-49992

Hain, S., Melles, M., **Evidence for a marine molluscan fauna beneath ice shelves in the Lazarev and Weddell seas, Antarctica, from shells of *Adamussium colbecki* and *Nacella* (*Patinigera*) cf. *concinna***, *Antarctic science*, Mar. 1994, 6(1), p.29-36, Refs. p.35-36.

Only one living specimen of *Adamussium colbecki* was found amongst the shells of this species collected in the Lazarev and Weddell seas, and those of the limpet *Nacella* cf. *concinna* from three locations in the southern Weddell Sea. In order to explain this peculiarity, four hypoth-

eses are discussed. The possibility that the shells belong to living deep-water populations is in contradiction to the high number of trawl samples taken in the area and the abundance of empty shell material. ¹⁴C dates show the shells are recent, thus excluding the possibility that the shells belong to autochthonous fossil populations exposed on the seafloor. Lateral transport of living specimens or shells over long distances by marine currents or by ice is unlikely due to their state of preservation and the water circulation pattern. The most likely explanation is that the shells are allochthonous, transported only over short distances by marine currents from adjacent areas underneath floating ice shelves where both species have living populations. (Auth.)

B-49994

Smith, R.I.L., **Species diversity and resource relationships of South Georgian fungi**, *Antarctic science*, Mar. 1994, 6(1), p.45-52, Refs. p.49-50.

The occurrence and distribution of the South Georgia fungal flora, particularly Ascomycotina and Basidiomycotina, is assessed in terms of habitat and substrate preference. The 113 taxa reported comprise 37 basidiomycetes, 49 ascomycetes, 6 myxomycetes and at least 21 lower fungi. Peat and litter substrata associated with tall tussock grassland have a rich macro-fungal flora, and numerous species occur in bog and mire communities, some in abundance from mid to late summer. Many micro-fungi and ascomycetes colonize dying leaves and inflorescences of specific vascular plants, and a few colonize bryophytes and lichens. At least a dozen species, probably non-indigenous, are associated with rotting timber and other imported materials at former whaling stations. An intensive survey of the South Georgia mycoflora is necessary to gain better understanding of their role in decomposition and nutrient cycling processes in the principal plant communities. (Auth.)

B-49996

Vacchi, M., La Mesa, M., Castelli, A., **Diet of two coastal nototheniid fish from Terra Nova Bay, Ross Sea**, *Antarctic science*, Mar. 1994, 6(1), p.61-65, 25 refs.

An investigation into the feeding habits of two demersal nototheniids, *Trematomus bernacchii* and *T. centronotus*, showed that the most important prey were polychaetes, molluscs and euphausiids for *T. bernacchii* and polychaetes and amphipods for *T. centronotus*. Epifaunal (e.g. *Barukia cristata*) and tube-dwelling polychaetes (*Amphicteis* cf. *midas* and *Amythas membranifera*) were common in the diet of both species. Bivalvia including *Adamussium colbecki* were found in the diet of *T. bernacchii*. Epifaunal gastropods (Trochidae) were an occasional prey for *T. centronotus*. Amphipods (mainly Acanthonotozomatidae) and the euphausiid *Euphausia frigida* were the main crustacean food of *T. centronotus* and *T. bernacchii* respectively. The data suggest a difference in the feeding behavior of the two nototheniid species, although both appear capable of feeding on common epibenthic invertebrates. (Auth.)

B-49997

Nedwell, D.B., Russell, N.J., Cresswell-Maynard, T., **Long-term survival of microorganisms in frozen material from early antarctic base camps at McMurdo Sound**, *Antarctic science*, Mar. 1994, 6(1), p.67-68, 6 refs.

Plate counts were made of bacteria surviving in materials from Shackleton's and Scott's camps from the first decade of this century. Several millions of bacteria per g of material were detected in samples of pony dung and lesser numbers in dried peas, pearl barley, chaff and straw. No coliforms had survived in the dung; apparent positives in the presumptive coliform counts proved to be sporing *Bacillus* spp. when tested in a confirmatory coliform test. Subsamples of the colonies growing on agar plates all proved to be either *Bacillus* spp. producing endospores or actinomycetes (*Micromonospora* spp.) with single spores along the hyphae. (Auth.)

B-50004

Convey, P., Smith, R.I.L., **Investment in sexual reproduction by antarctic mosses**, *Oikos*, Nov. 1993, 68(2), p.293-302, Refs. p.301-302.

Four measures of allocation to sexual reproduction in mosses are proposed and applied to data obtained from 15 species found fruiting on Signy I. Spore counts and size measurements are reported for each species.

Larger spore sizes in most short-lived species suggest that spores may have an important role in local colonization. Five species with small spore dimensions, high counts and wide antarctic distributions are identified as potential long-distance colonists. Investment in sexual reproduction is estimated using two measures; both measures show that investment by annual and short-lived species is greater than that found in most perennial species. The short-lived species examined in this study may be classified as annual or short-lived shuttle species (*sensu* During). Their reproductive behavior largely agrees with the predictions of life history models, and they may be described as ruderal (*sensu* Grime) or r-selected. However their production of relatively few large spores is at variance with the predictions of these models. The sexual behavior of longer-lived species agrees less well with theoretical predictions, with some showing surprisingly large levels of investment, although others can be described as a-selected (*sensu* Greenslade) or stress tolerators (*sensu* Grime), with much lower investment in sexual reproduction. (Auth. mod.)

B-50005

Ligowski, R., **Marine diatoms (*Bacillariophyceae*) in the antarctic ecosystem and their importance as an indicator of a food source for krill (*Euphausia superba*) Dana** [Morskie okrzemki (*Bacillariophyceae*) w ekosystemie Antarktyki i ich znaczenie jako wskaźnika źródła pokarmu kryla (*Euphausia superba*) Dana], Łódź, Wydawnictwo Uniwersytetu Łódzkiego, 1993, 241p., In Polish with English summary. Refs p.208-230.

The distribution of diatoms was studied in different marine habitats (water column, sea ice, sea bottom) to determine the sources of krill food in different areas and seasons using the indicative value of diatoms. Study materials were collected during 5 Polish antarctic expeditions in the western South Atlantic from 1981 to 1989. Altogether 650 diatom samples from West Antarctica were considered, including 236 planktonic diatoms, 121 sea ice diatoms, 125 sessile diatoms and 168 found in krill stomachs. Two hundred seventy eight taxa were identified (frequency is shown in a table). In net phytoplankton, 234 diatom taxa were recognized, but only 40 taxa can be regarded as constant species in the water column; 55 taxa were dominant. Of the sea ice samples, 161 diatom taxa were identified, of which there were 18 dominant taxa from the open sea and 25 from Admiralty Bay. In krill stomach contents, 103 diatom taxa were found. It is concluded that diatoms are the only taxonomic group in krill food known well enough to allow comparison between various habitats, and are therefore of exceptional value as indicators of krill food sources. A quantitative estimation of data presented in numerous tables and figures is given.

B-50006

Klöser, H., et al, **On the competitive balance of macroalgae at Potter Cove (King George Island, South Shetlands), *Polar biology***, Jan. 1994, 14(1), p.11-16, Refs. p.15-16.

The sublittoral zonation of macroalgae and abundant animals in Potter Cove is described in relation to substrate, exposure to turbulence and impact of grounding icebergs. Implications on the ecological niches of the most prominent phaeophytes are discussed. It is concluded that *Desmarestia anceps* and *D. menziesii* exclude *Himantothallus grandifolius* under favorable conditions. However, *Himantothallus*, by its potential to inhabit unstable substrates, may be better adapted to withstand the ice impact. The replacement of *Desmarestia* by *Himantothallus* at greater depth can be explained only partially at present. (Auth.)

B-50007

Moreno, J., et al, **Hatching asynchrony, sibling hierarchies and brood reduction in the Chinstrap penguin *Pygoscelis antarctica***, *Polar biology*, Jan. 1994, 14(1), p.21-30, 42 refs.

Patterns of chick growth and mortality in relation to egg size and hatching asynchrony were studied during two breeding seasons (1991 and 1992) in a colony of Chinstrap penguins of the Vapour Col rookery on Deception I. Results show that there is food limitation in this population during the crèche phase in some years; that asynchronous hatching does not facilitate early brood reduction, and that it does not ensure stable size hierarchies between siblings. Brood reduction due to starvation is not associated with prior asymmetry and does not facilitate the survival or improve the growth of the surviving chick. Asynchronous hatching may be a consequence of thermal constraints on embryo development inducing incubation of eggs as soon as they are laid. (Auth. mod.)

B-50008

Chauhan, S., Shivaji, S., **Growth and pigmentation in *Sphingobacterium antarcticus*, a psychrotrophic bacterium from Antarctica**, *Polar biology*, Jan. 1994, 14(1), p.31-36, 32 refs.

Sphingobacterium antarcticus, a yellow pigmented psychrotrophic bacterium from Antarctica exhibited enhanced pigmentation with increasing temperatures of incubation. This behavior was opposite to mesophilic *Sphingobacterium* in which pigmentation was reduced upon raising temperatures. The UV-visible spectrum of the crude pigment was characteristic of carotenoids and the pigment gave negative tests for flexirubins. Diphenylamine (DPA), a standard biochemical blocker of carotenoid biosynthesis, reduced the growth of broth cultures when grown at extremes of the optimum temperature. Mutants defective in pigmentation were capable of growing between 1-31 C, suggesting that pigmentation does not play any role in adapting the bacterium to the psychrotrophic growth temperature. Results suggest that DPA, which is known to block desaturation reactions in the carotenoid biosynthesis pathway, may be affecting other desaturation reactions within the bacterium, thereby causing reduced growth at extreme temperatures. (Auth.)

B-50009

Carlini, A.R., et al, **Southern elephant seal, *Mirounga leonina*: composition of milk during lactation**, *Polar biology*, Jan. 1994, 14(1), p.37-42, Refs. p.41-42.

An analysis of milk constituents during various stages of lactation in the southern elephant seal *Mirounga leonina* was carried out. Forty-six milk samples were taken from 30 females throughout lactation during 1985, 1987, 1990 and 1991 on Stranger Point. Total nitrogen (TN), non-protein nitrogen (NPN), sugar, fat, ash and water were measured, and from some of these data true protein and energy content were calculated. The results showed a high degree of variation in water and fat concentrations among samples at different stages of lactation. During the first 20 days the fat content of milk increased from about 12 to approximately 52%, while water content fell from 70 to 33%. The composition of milk changes rapidly during the first days post-partum. Protein, minerals and sugar appear to remain stable after the fourth day of lactation. Milk samples contain significant levels of sugars; thin layer chromatography indicates the presence of lactose and glucose together with other unidentified components. There is evidence of a striking change in composition of the milk in the latter stage of lactation; the progressive increase in the fat:water ratio is abruptly reversed just prior to weaning. (Auth.)

B-50010

Gaino, E., Bavestrello, G., Cattaneo-Vietti, R., Sará, M., **Scanning electron microscope evidence for diatom uptake by two antarctic sponges**, *Polar biology*, Jan. 1994, 14(1), p.55-58, Refs. p.57-58.

Scanning electron microscopy (SEM) investigation of two antarctic sponges, *Phorbas glaberrima* and *Tedania charcoti*, showed that the exopinacoderm effects a direct uptake of benthic diatoms which settle on the sponge surface. In *P. glaberrima*, planktonic diatoms were also observed penetrating through the inhalant system, the primary way of feeding in sponges. Benthic diatoms which accumulate in the mesohyl underneath the exopinacoderm help to strengthen the sponge cortex and may be an alimentary source during oligotrophic periods in the antarctic environment. (Auth.)

B-50012

Convey, P., **Photosynthesis and dark respiration in antarctic mosses—an initial comparative study**, *Polar biology*, Jan. 1994, 14(1), p.65-69, 24 refs.

Rates of dark respiration (DR), gross photosynthesis (GPS) and net photosynthesis (NPS) were investigated for 14 species of moss from a maritime antarctic locality. The rates found were similar to those reported in studies of temperate, alpine and arctic species, indicating no physiological specialization to the antarctic environment. There was no relationship between the habitat occupied by a species (hydric, mesic, xeric) and physiological measures. There was, however, a loose correlation between NPS and a species' ecology or reproductive behavior in the maritime Antarctic, species with high NPS being either colonists or those that show high and regular investment in sporophyte production. (Auth.)

B-50013

Raymond, J.A., Sullivan, C.W., DeVries, A.L., **Release of an ice-active substance by antarctic sea ice diatoms**, *Polar biology*, Jan. 1994, 14(1), p.71-75, 27 refs.

Interstitial water from the diatom-rich ice platelet layer in McMurdo Sound contains a macromolecular, ice-active substance (IAS) that, at *in situ* concentrations, causes dense pitting on the basal surfaces of growing ice platelets. In this respect, it resembles several fish antifreezes that also cause pitting on ice surfaces, but unlike the antifreezes, it does not lower the freezing point. The IAS appeared to be released by diatoms, as extracts from the diatoms contained IAS, while seawater from a diatom-free area did not. No evidence of IAS was found in several species of temperate water diatoms. The ice-pitting activity of the IAS was destroyed by proteases and by incubation with galactosidase or endonuclease. Thus, activity appears to arise from a protein or protein component, and not from carbohydrate or nucleic acids. Potential roles of the IAS in the sea ice community are discussed. (Auth.)

B-50023

McMeekin, T.A., et al, **Biology and biotechnological potential of halotolerant bacteria from antarctic saline lakes**, *Experientia*, Dec. 15, 1993, 49(12), p.1042-1046, 41 refs.

The saline lakes of the Vestfold Hills are unique ecosystems in which microorganisms survive and grow in cold, saline and often anaerobic conditions. A polyphasic approach to taxonomy of the microbiota has extended the known range of microbial diversity through description of 9 new species, including bacteria and archaea. Low temperature and reduced water activity are the major constraints on microbial growth in the lakes. Bělehrádek-type models provide a good description of temperature dependence and indicate the potential of the microbiota to colonize their natural habitats. Physiological traits of the microbiota selected by the physical and chemical characteristics of the saline lakes suggest biotechnological potential in areas such as polyunsaturated fatty acid production and hydrocarbon degradation. (Auth.)

B-50024

Vincent, W.F., Downes, M.T., Castenholz, R.W., Howard-Williams, C., **Community structure and pigment organisation of cyanobacteria-dominated microbial mats in Antarctica**, *European journal of phycology*, Nov. 1993, 28(4), p.213-221, 21 refs.

Benthic microbial mat communities were sampled from 20 lakes, ponds and streams of the McMurdo Sound region. At least 5 distinct assemblages could be differentiated by their cyanobacterial species composition, pigment content and vertical structure. The most widely occurring freshwater communities were dominated by thin-trichome oscillatoriacean species that formed benthic films up to several millimeters thick. 'Lift-off mats' produced mucilaginous mats 1-5 cm thick at the surface and edge of certain ponds. Another group of oscillatoriacean communities was characteristic of hypersaline pond environments; these communities were dominated by species with thicker trichomes such as *Oscillatoria priestleyi*. Black mucilaginous layers of *Nostoc commune* were widely distributed in aquatic and semi-aquatic habitats. Dark brown sheath pigmentation was also characteristic of less cohesive mats and crusts dominated by *Pleurocapsa*, *Gloeocapsa* and *Calothrix*. High performance liquid chromatography analysis of the lipophilic pigments showed that the upper region of most of the antarctic mats was enriched in sheath pigments (scytonemin) and/or certain carotenoids such as myxoxanthophyll and canthaxanthin. (Auth. mod.)

B-50040

Clarke, J., Nicol, S., **Blood viscosity of the Little penguin, *Eudyptula minor*, and the Adélie penguin, *Pygoscelis adeliae*: effects of temperature and shear rate**, *Physiological zoology*, Sep./Oct. 1993, 66(5), p.720-731, 21 refs.

Investigation is made of the effects of temperature on blood viscosity of two species of penguin, the Temperate Zone little penguin (*Eudyptula minor*) and the antarctic Adélie penguin (*Pygoscelis adeliae*), and the domestic chicken. When the blood was adjusted to the same hematocrit, there was no difference between the viscosity of blood from the two penguins, while at all temperatures and shear rates the chicken blood had the highest viscosity. This contradicts the results of earlier research which claimed that, at low temperatures and low shear rates, the blood of antarctic

tic penguins had higher viscosities than that of other bird species. That research also suggested that high blood viscosity at low temperatures and shear rates would serve as a heat conservation mechanism. On the contrary, the present authors suggest that the viscous behavior of penguin blood represents an adaptation to maintain blood flow in extremities during immersion in cold water. (Auth. mod.)

B-50041

Ponganis, P.J., Kooyman, G.L., Castellini, M.A., **Determinants of the aerobic dive limit of Weddell seals: analysis of diving metabolic rates, postdive end tidal PO₂'s, and blood and muscle oxygen stores**, *Physiological zoology*, Sep./Oct. 1993, 66(5), p.732-749, 32 refs.

The mean aerobic dive limit (ADL) for Weddell seals was calculated from data collected on diving metabolic rates (VO₂) and blood and muscle O₂ stores. Mean diving VO₂ of adult seals during predominantly exploratory dive patterns was 4.5 mL O₂/kg/min; mean VO₂ of a subadult seal engaged in foraging dive bouts was 8.5 mL O₂/kg/min. The adult value was 30% greater than that used in past ADL calculations. Mean plasma volume was 7% body mass (BM); blood volume calculated with the highest hematocrit (Hct) observed (66) was 21% BM. Hemoglobin concentration at such an Hct was 26% by weight. End tidal PO₂ (pre- and postdive) justified the use of 95% and 20% arterial O₂ saturations in the blood O₂ store calculation. Total blood O₂ stores were 50% greater than those used in past ADL calculations. Mean myoglobin concentration (5.4% by weight) and more recent anatomical estimates of muscle mass yielded a 35% increase in muscle O₂ stores. The mean estimated ADL for a 450-kg seal calculated with these new data was 19.1 min, 2.3 min greater than in past calculations and only 1 min less than the 20-min inflection point of the curve of dive duration versus postdive lactic acid appearance. For the subadult engaged in foraging dives, the mean estimated ADL was about 9 min, again quite similar to past ADL calculations. (Auth.)

B-50042

Cherel, Y., Charrassin, J.B., Handrich, Y., **Comparison of body reserve buildup in prefasting chicks and adults of king penguins (*Aptenodytes patagonicus*)**, *Physiological zoology*, Sep./Oct. 1993, 66(5), p.750-770, 46 refs.

Like other penguin species, adult king penguins fast for several weeks when they molt and at the beginning of their breeding cycle. Moreover, chicks of this species can withstand up to 5 mo. of food deprivation during the austral winter. To assess possible variation in the prefasting amounts of nutrient reserves, body composition of adults and chicks of king penguins was determined at the beginning of their long-term fasts. Accumulation of subcutaneous fat stores anticipates each of these periods and appears to be an obligatory prerequisite to fasting. However, prewinter chicks contained 1 kg more fat, and consequently had a higher adiposity than premolting chicks and prebreeding adults, indicating that the higher the fat stores, the higher the fast resistance. Premolt chicks also possess a lower lean body mass, which minimizes their fasting energy expenditure. Adult molt is anticipated by a 3.3 kg body mass increase due mainly to water and protein. Integument and pectoral muscles account for 84% of this body mass difference. The increase in integument mass involves water and fat whereas that in breast muscle mass involves protein and water. Such protein stores anticipate the use of endogenous body protein for new feather synthesis during the molting fast. This study clearly shows that different amounts of fat and protein are built up in anticipation of fasts of different durations and nutrient needs in king penguins. (Auth. mod.)

B-50043

Boyd, I., Arnborn, T., Fedak, F., **Water flux, body composition, and metabolic rate during molt in female southern elephant seals (*Mirounga leonina*)**, *Physiological zoology*, Jan./Feb. 1993, 66(1), p.43-60, 34 refs.

Tritiated water dilution was used to measure changes in the proximate body composition of adult female southern elephant seals at the end of lactation and at the beginning and end of molt. During the 72 d foraging phase between lactation and molt, seals gained 1.50 kg/d. Of the total mass gain, 49% was water, 39% was fat, and 11% was protein. This represented an increase in total body gross energy of 2,111 MJ throughout the foraging period. The rate of mass lost during molt was 4.70 kg/d comprising 49% water, 33% fat and 16% protein. Although it was impossible to measure

accurately the duration of fasting during the molt, the minimum cost of molt was 1,631 MJ, which was not significantly different from the energy gained between lactation and molt. Females invested half as much in molt as in the growth of their pups. The metabolic rate during molt was 2.15 W/kg, which was 2.8 times the predicted resting metabolic rate. Water influx was greater than expected from metabolic water production, and seals had an additional water influx of 1.75 L/d. This additional influx was negatively related to metabolic water production. There was some evidence from measurements of water influx that seals fed during molt, but this accounted for only 11.5% of the daily energy expenditure. (Auth.)

B-50044

Robertson, G., Newgrain, K., **Efficacy of the tritiated water and ^{22}Na turnover methods in estimating food and energy intake by Emperor penguins *Aptenodytes forsteri***, *Physiological zoology*, Sep./Oct. 1992, 65(5), p.933-951, 43 refs.

The accuracy of the tritiated water (HTO) and sodium-22 (^{22}Na) turnover methods as estimators of dietary water and sodium intake was evaluated in emperor penguins fed separate diets of squid and fish. Emperor penguins assimilated 76.2% and 81.8% of available energy in the squid and fish diets, respectively. Both isotopes had equilibrated with body water and exchangeable sodium pools by 2 h after intramuscular injection. The tritium method yielded reliable results after blood isotope levels had declined by 35%. On average the tritium method underestimated water intake by 2.9%, with a range of -10.3% to +11.1%. The ^{22}Na method underestimated Na intake on average by 15.9%, with the errors among individuals ranging from -37.2% to -1.8%. Discrepancies with ^{22}Na turnover were significantly greater with the squid diet than the fish diet. The results confirm the reliability of the tritium method as an estimator of food consumption by free-living emperor penguins (provided seawater and freshwater ingestion is known), and support the adoption of the ^{22}Na method to derive an approximation of seawater intake by tritiated emperor penguin chicks and by tritiated adults on foraging trips of short duration. (Auth.)

B-50045

Croll, D.A., Nishiguchi, M.K., Kaupp, S., **Pressure and lactate dehydrogenase function in diving mammals and birds**, *Physiological zoology*, Sep./Oct. 1992, 65(5), p.1022-1027, 11 refs.

Emperor penguins, elephant seals, and sperm whales have been shown to dive to considerable depths, 265 m, 1,500 m, and 1,140 m, respectively. These animals must cope with extreme changes in hydrostatic pressure as they dive. The effects of hydrostatic pressure on the Michaelis-Menten constant, $K(m)$, of cofactor binding of NADH of muscle M_4 (muscle type) lactate dehydrogenase (LDH) was measured for these diving vertebrates and compared with a nondiving mammal, the domestic rabbit. No effect of pressure changes as great as 2.066×10^4 kPa (204 atm) was observed in either the diving or nondiving species LDH preparations. Results support the hypothesis that, at least concerning the $K(m)$ of NADH in the M_4 LDH of the diving vertebrates examined, the LDHs of warm-blooded divers do not appear to be affected by changes in hydrostatic pressure and the enzyme may be preadapted for insensitivity to pressure perturbations. (Auth.)

B-50046

Brandt, A., **Antarctic serolidae and cirolanidae (Crustacea: Isopoda): new genera, new species, and redescriptions**, *Theses zoologicae*, Vol.10, edited by R. Fricke, Koenigstein, Federal Republic of Germany, Koeltz Scientific Books, 1988, 143p., With German summary. 47 refs.

DLC MLCM 92/03282

During the expeditions Antarktis I-Antarktis II (1983-1985) of RV *Polarstern*, the following Serolidae were collected in the Weddell Sea: *Serolis aestimabilis* n.sp.; *Serolis nobilis* n.sp.; *Serolis waegelei* n.sp.; *Serolis serratus* n.sp.; *Serolis leachi* n.sp.; *Serolis reptans* n.sp.; *Ceratoserolis pasternak* (Kussakin, 1967); *Serolis bouvieri* Richardson, 1906; *Serolis beddardi* Calman, 1920; *Serolis polita* Pfeffer, 1887 and *Serolis pagenstecheri* Pfeffer, 1887. *Serolis septemcarinata* Miers, 1875 and *Serolis acuminata* Sheppard, 1933 were described with the reexamination of type material. Some new genera have been erected: *Acanthoserolis* n.gen.; *Acutiserolis* n.gen.; *Cuspidoserolis* n.gen.; *Cristaserolis* n.gen.; *Spinoserolis* Nordenstam, 1933 and *Leptoserolis* n.gen. Additionally rede-

scriptions of the antarctic cirolanid species *Natatolana albinota* (Vanhöffen, 1914), *Natatolana intermedia* (Vanhöffen, 1914), *Natatolana obtusata* (Vanhöffen, 1914) and *Natatolana oculata* (Vanhöffen, 1914) are present. (Auth.)

B-50047

Wang, Z., Norman, F.I., **Timing of breeding, breeding success and chick growth in south polar skuas (*Catharacta macrorhynchos*) in the eastern Larsemann Hills, Princess Elizabeth Land, East Antarctica**, *Notornis*, Sep. 1993, 40(3), p.189-203, 31 refs.

Details are given of the reproduction process in a small population of south polar skuas nesting in the Larsemann Hills. Eggs were laid from mid-Nov. to mid-Dec., chicks hatched from mid-Dec. to early Jan. and fledged from Feb. 5 onwards. Breeding success in the 13 regularly monitored nests averaged 0.5 chicks fledged per pair, i.e. 0.26 per egg laid. Asynchronous hatching resulted in most first chicks dominating their siblings; they grew faster and survived better than the second chicks, presumably as the result of more food. Second eggs were significantly smaller than first eggs, and egg size and volume gave rise to slight differences in mass at hatching; this did not appear to influence chick growth. Food availability, unfavorable weather conditions and predation by other skuas were the main factors influencing chick growth and successful chick rearing; the presence of sibling aggression may have reduced survival in second chicks. Breeding success in the Larsemann Hills is considered in relation to foods available from feeding territories or from station refuse; in the small samples available, those pairs with obvious territories or with access to refuse reared more chicks to the flying stage. (Auth. mod.)

B-50054

Moiseev, E.V., **Quantitative characteristics of the nanoheterotrophic community in the Weddell Sea**, *Akademiia Nauk SSSR. Doklady. Biological sciences*, Sep. 1993, 329(1-6), p.133-136, Translation of Akademiia Nauk SSSR. Doklady, 329(6):798-801. 12 refs.

This investigation isolated a group of nanoheterotrophic organisms measuring 2-20 microns that included zooflagellates, sarcoid and heterotrophic phytoflagellates. In antarctic waters investigations of nanoheterotrophic plankton are in their initial stages, but because of the sparseness of quantitative data it is difficult to determine its role in the planktonic community of the southern ocean. Among the nanoheterotrophs the order Choanoflagellida (class Zoomastigophorea) has received the most attention to date. Other groups of nanoheterotrophic organisms in the waters of Antarctica remain almost unstudied, although it is known that in other high-latitude regions of the World Ocean small zooflagellates play an extremely significant role and often predominate in the composition of groups of nanoheterotrophic organisms. Among nanoheterotrophs only a few zooflagellates are needed to consume up to 60-70% of the daily bacterial production while, being intermediates in the food chain, they themselves are consumed by larger zooplankton. In antarctic waters the remains of the cases of choanoflagellates are found in the stomach of krill. Therefore, it was important to clarify the quantitative characteristics of the whole 2-20 micron size group and to determine the percentage of the order Choanoflagellida in the biomass of nanoheterotrophic organisms, to study the principles governing their distribution, and to understand the seasonal changes. (Auth. mod.)

B-50055

Shaughnessy, P.D., **Immobilisation of crabeater seals, *Lobodon carcinohagus*, with ketamine and diazepam**, *Wildlife research*, 1991, 18(2), p.165-168, 12 refs.

The anesthetic ketamine hydrochloride and the tranquilizer diazepam (valium) were used to immobilize ten adult crabeater seals for studies of breeding biology and lactation carried out on pack-ice off the coast of Enderby Land in the spring of 1985. In 17 trials, dose rates averaged 6 mg/kg ketamine and 0.2 mg/kg diazepam. Repeat treatments were 4-7 days apart. Time to handling was 20-40 min. Muscle tremors were alleviated with diazepam. One animal died after receiving low doses and showing signs of recovery. The suspected cause of death was asphyxiation caused by frozen exhalations on a canvas bag held over its head. No other adverse reactions were observed. (Auth.)

B-50056

Green, K., Wong, V., Burton, H.R., **Population decline in Weddell seals: real or sampling artefact**, *Wildlife research*, 1992, 19(1), p.59-64, 17 refs.

Aerial counts of Weddell seals during the moult did not provide a useful index of population trends. Seals may spend longer foraging in the water in some years than in others (possibly because of changes in food availability), with the result that differing proportions of the population are counted in different years. It is concluded that little can be inferred about interannual differences in population sizes without reference to the size of the breeding population. (Auth.)

B-50065

Cescon, P., **Italian antarctic research on the chemistry of environmental impact** [Ricerche italiane in Antartide: impatto ambientale, metodologie chimiche, attività e risultati scientifici], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.77-97, In Italian with English and Spanish summaries. 3 refs.

The Italian scientific program on environmental chemistry regards the study of the distribution, transport and accumulation of chemical substances (both organic and inorganic) as of outstanding environmental interest (from geochemical, biological and toxicological viewpoints) in various components of the antarctic ecosystem: seawater, marine particulate, marine sediment and organisms, pack ice, snow, continental ice, lake water and sediment, melt water, soil, vegetation, air and aerosol. In seawater, the study focuses on the microcontaminants present in subtrace quantities. In particular, attention is given to heavy metals and metalloids, and organic components of anthropic (e.g. PCB, pesticides) and natural (e.g. humic and fulvic acids) origin. Snow samples were analyzed to determine concentrations of acetates, formates and metasilphonic acid, which resulted in higher values than those found by other researchers in ice cores from Antarctica, but are comparable with results reported for rain precipitation in unpolluted areas. In the soil, PCB concentrations of the order of a few ng/g were measured. In the troposphere, measurements of CCl₄ and CFCs show latter ranging between 3 and 423 ppt. Determination of radionuclides from fallout and of natural origin shows values for ¹³⁷Cs in the soil not higher than 5 Bq/kg dry weight. Higher values have been detected in vegetation and in lake water and sediments. The investigation of the marine system was completed by the determination of inorganic elements and metal-organic substances in marine organisms. Results are presented in tables. (Auth. mod.)

B-50066

Chiang, J., **Heavy metals in marine sediments from Chile, and mercury levels in marine organisms from Terra Nova Bay** [Metales pesados en sedimentos y organismos marinos provenientes de las zonas norte, centro y centro-sur de Chile. Niveles de mercurio en organismos marinos provenientes de Bahía Terra Nova (Antártica)], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.99-105, In Spanish with English and Italian summaries. 11 refs.

The author discusses briefly the occurrence of mercury in the scallop *Adamussium colbecki* and in the fish *Pagothenia bernachii* from Terra Nova Bay, and notes that the high values found are similar to or higher than those found in various fishes from central Chile.

B-50072

La Ferla, R., Acosta Pomar, L., Allegra, A., Bruni, V., **Microbial distribution in coastal stations of Terra Nova Bay** [Distribuzione microbica in stazioni costiere della Baia Terra Nova], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.149-153, In Italian with English and Spanish summaries. 7 refs.

During the 5th Italian oceanographic cruise to Antarctica, a study was carried out on the microbial distribution at coastal stations within Terra Nova Bay in connection with a study on particulate organic matter. Total bacterioplankton, picophytoplankton and heterotrophic aerobic bacteria

values showed a discrete homogeneity along the whole coast. The authors discuss the significance of the different microbial components in this antarctic environment. (Auth.)

B-50073

El-Sayed, S.Z., **Will the ozone hole over Antarctica affect the productivity of the southern ocean**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.157-170, With Italian and Spanish summaries. Refs. p.169-170.

Recent reports on the ozone hole over Antarctica have renewed concern about the consequences of increased levels of UV-B reaching the earth's biosphere. One area of concern involves phytoplankton, which constitutes the base of the food web in aquatic ecosystems. The results of a month-long study on the effects of UV radiation on antarctic phytoplankton and ice-algae showed an enhancement of the photosynthetic rates when UV was excluded; conversely, primary productivity rates were lower under enhanced UV conditions. Significant changes in phytoplankton pigmentation also occurred as a result of changes in the UV levels. The implications of these findings to the understanding of the trophodynamics of the southern ocean and the bearing these have on global marine productivity are discussed. (Auth.)

B-50074

Maugeri, T.L., **Microbiological research during Italian antarctic oceanographic expeditions** [Ricerche microbiologiche in Antartide—Campagne oceanografiche italiane 1987/88 e 1989/90], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.173-186, In Italian with English and Spanish summaries. 17 refs.

The first microbiological studies during the Italian oceanographic expedition of 1987/88 were for the most part explorative. The presence and the role of microorganisms were studied in seawater samples from Terra Nova Bay. Data concerning the spatial distribution of the heterotrophic aerobic cultivable bacteria and marine picoplankton observed by an epifluorescence microscope were obtained. Biochemical activity and sensitivity to temperature were studied on the isolated strains. During the summer expedition of 1989/90, the temporal variations of microbial marine communities were studied by direct and indirect methods (microscopic and cultural) at two stations. Results obtained demonstrate that microorganisms are always present and show good adaptation to low temperatures. The seawater sampled from the two stations was highly productive; high numbers of picoplankton cells and high numbers of colonies on Marine Agar incubated at +4 °C were counted. The microbial standing crop demonstrates high values of biomass, similar to those of the temperate zones. The taxonomic screening on isolates showed genera that are similar to those recognized by other authors. Autofluorescent cells were found at depths of 50-100 m. The eukaryotic cells were more frequent than the cyanobacterial cells, which are quite rare. (Auth. mod.)

B-50075

Monticelli, L., **Microbiology of surface waters and sediments in Cierva Cove** [Estudio microbiológico preliminar en aguas superficiales y sedimento litoral de la Caleta Cierva (Antártica, 64.2S y 60.9W, SCAR:SSSI No.15)], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.187-195, In Spanish with Italian and English summaries. 5 refs.

Preliminary results of a microbiological study carried out in surface waters and sediments of the littoral zone of Cierva Cove are described. The field laboratory work was performed in the summers of 1986-1988. The taxonomic and physiologic determinations were made in waters 0.5-3 m deep at a mean temperature of 0.5 °C. The mean values obtained for aerobic heterotrophic bacteria were: surface sea water 4.2×10^2 U.F.C. x/ml; neuston 3.7×10^4 U.F.C. x/ml and sediment 2.9×10^4 U.F.C. x/g. A total of 122 strains was isolated, of which only 76% maintained viability in the laboratory. Dominant thermo groups were psychrophilic and psychrotrophic (93.3%); a small proportion of mesophiles was observed, probably of terrigenous origin; 94.4% of the flora consisted of gram negative bacilli. The presence of *Pseudomonas* and related genera is noted in all environments with a low proportion of Vibrionaceae. Significant dif-

ferences were observed among the microorganisms of each of the studied environments, both at the generic level and in relation to biochemical activities. (Auth. mod.)

B-50076

Acosta Pomar, M.L., **Phytoplankton spatial and temporal variations in Terra Nova Bay** [Variazioni spazio temporali della comunità picofitoplanctonica nella Baia di Terra Nova (Mare di Ross)], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.197-212, In Italian with Spanish and English summaries. 28 refs.

Spatial-temporal variations of the autofluorescent microbial planktonic community were studied at two stations of Terra Nova Bay during the summer of 1989-90. The ability of total picoplanktonic and autofluorescent component to divide was tested in some representative sea water samples. The results obtained show picophytoplanktonic cell density oscillating between 10^4 and 10^5 cells/l and that these organisms are present down to 100 m depth. The prokaryotic fraction gave values between 10^4 and 10^5 cells/l, while the cell density of the eukaryotic component varies between 10^4 and 10^7 cells/l and generally predominates over the first. The cyanobacteria are always associated with frustules or detritus and are not to be found below 50 m. Eukaryotics less than 2 microns in diameter with well-defined red chloroplasts generally follow a trend contrary to that of the bright green cyanobacterial component; autofluorescent cells less than a micron and hard to identify were also found. Picophytoplanktonic organisms on the average represented 60% of the autofluorescent biomass observed. On examining the results one can deduce that the total picoplankton, with a dividing capacity, represents 0.0001% to 0.2% of the samples studied. The autofluorescent component, sensitive to treatment with acids inhibiting cellular division, was shown to be between 20 cells/l (0.00046%) and 2×10^3 cells/l (0.00014%). The total picophytoplankton and picoplanktonic percentage sensitive to treatment inhibiting cellular division suggests that they represent a metabolically active fraction of the total pico- and picophytoplanktonic biomass. (Auth. mod.)

B-50077

La Ferla, R., et al, **Spatial-temporal variations of the microbial biomass in Terra Nova Bay** [Variazioni spazio temporali della biomassa microbica nella Baia Terra Nova], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.213-219, In Italian with Spanish and English summaries. 18 refs.

During the oceanographic cruise of 1989-90 to Antarctica, the spatial-temporal variations of the microbial biomass at two stations located within Terra Nova Bay were studied through the determination of ATP and LPS. Results have shown a significant oscillation of ATP values with time and through the water column, while LPS showed a greater homogeneity. In general, values are similar to those normally encountered in sea water. (Auth. mod.)

B-50078

Troncoso, V.A., et al, **Bacterial production around the South Shetland Islands** [Abundancia y producción bacteriana alrededor de las Islas Shetland del Sur. Estudio preliminar], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.221-223, In Spanish with Italian and English summaries. 8 refs.

In studies of spatial distribution of bacterioplankton and the bacterial production conducted in samples originating from 21 stations, during the 26th Chilean Antarctic Expedition in 1990, the abundance and primary production around the South Shetland Is. were measured. The mean abundance was 2.25×10^8 cells/l (D.E. = 1.35). Mean BSP (Bacterial Secondary Production) for Feb. was 1.65 micrograms/Cl/d (D.E. = 5.45) and integrated BSP was 71.13 mgC/m²/d (D.E. = 35.25). The bacterioplankton of the South Shetland Is. varies between 7 and 25% of the fixed carbon. This indicates that the free bacteria of antarctic waters form an important assemblage that needs to be evaluated. (Auth. mod.)

B-50079

Hecq, J.H., Guglielmo, L., **Structure and functioning of the**

Ross Sea pelagic ecosystem: an interdisciplinary approach, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.227-233, 12 refs.

On the basis of hydrological, chemical and biological data obtained during the 5th Italianartide cruise, different areas have been recognized in the Ross Sea and in the Pacific Sector of the antarctic ocean as typical of the springtime period. The different characteristic areas are not to be taken as different ecosystems but as different temporal steps of a typical ecosystem evolving from pack ice to ice-free waters. Results confirm that biomass, composition and productivity of the plankton ecosystem during spring in the Ross Sea seem to depend essentially on the time after the waters become ice-free. The following pattern is proposed: ice algae are liberated by melting ice into the water column, are grazed by zooplankton and later new planktonic populations are regenerated. The areas of divergence and, in general, areas of physicochemical gradients (where vertical currents are important) seem to be the most important from the point of view of plankton variations. (Auth. mod.)

B-50080

Innamorati, M., et al, **Phytoplankton biomass in the Ross Sea and environmental factors** [Indagine sulla biomassa fitoplanctonica nel Mare di Ross in relazione ai fattori ambientali], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.235-252, In Italian with Spanish and English summaries. 21 refs.

The research activity of the Phytoplankton Ecology group was carried out during the summers of 1987-88 and 1989-90 in Terra Nova Bay and along the route 45-75S. The main feature of Terra Nova Bay is the abundant phytoplankton biomass, while marked spatial variations are noted between 60S and the Bay, with oligotrophic and eutrophic areas. Nutrients are depleted in the 0-25 m layer due to phytoplankton consumption, although their concentrations are very high. Phytoplankton temporal variations do not show the classic unique summer bloom defined for polar regions, but there seem to exist two different blooms linked to melting and formation of ice. Underwater irradiance is particularly interesting because, with terrigenous inputs being practically absent, qualitative and quantitative variations are exclusively due to phytoplankton. (Auth.)

B-50081

Nuccio, C., Innamorati, M., Lazzara, L., Mori, G., **Phytoplankton populations in Terra Nova Bay** [Popolamenti fitoplanctonici nella Baia di Terra Nova, Mare di Ross], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.253-262, In Italian with Spanish and English summaries. 8 refs.

The phytoplankton density in Terra Nova Bay presents wide variability, but the zone can be clearly defined as rich, with 250,000 cells/l as a mean in the 0-50 m stratum. The vertical distribution shows the maximum density in the neighborhood of the lower limit of the euphotic zone (ca. 30 m). Phytoplankton populations are generally dominated by nanoplanktonic forms; *Phaeocystis pouchetti* and unidentified nanoplanktonic forms reach, on the average, 40% and together with *Nitzschia* spp. and many Gymnodiniaceae, determine the predominance of the fraction comprised between 2 and 20 microns. The variety of taxa is not high but the populations appear well differentiated on the basis of their diverse phytocenosis. Their distribution shows three strata: the surface stratum (0-25 m) characterized by coenosis of Bacillarioficeae and mixed; the 50 m stratum characterized by the Primnesioficeae; and the underlying strata (100 and 200 m) characterized by the Dinoficeae. In general the quantitative predominance of the Bacillarioficeae is confirmed. (Auth.)

B-50082

Goffart, A., Catalano, G., Magazzù, G., Hecq, J.H., **Some examples of the influence of hydrodynamical constraints on the phytoplanktonic biomass distribution in the southern ocean**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.265-271, With Italian and Spanish summaries. 9 refs.

Examples from the Ross and Weddell seas and the Indian sector of the southern ocean, confirm that the distribution of primary producers is strongly influenced by hydrodynamic phenomena. Because phytoplankton is the base of the food web, accurate knowledge of mechanisms controlling primary productivity is essential to the understanding of the antarctic ecosystem. (Auth.)

B-50083

Magazzù, G., Decembrini, F., **Primary productivity data from Italian oceanographic expeditions of 1987-1988 and 1989-1990** [I risultati di produzione primaria nelle crociere oceanografiche 1987-88 e 1989-90 del Programma Nazionale di Ricerche in Antartide], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.273-284, In Italian with Spanish and English summaries. 16 refs.

The authors report the results from primary productivity investigations relative to the different size fractions of plankton obtained in the antarctic ocean during the 1987-88 and 1989-90 cruises of the Italian antarctic research program. During the first cruise (Dec. 87-Feb. 88) a section of the Ross Sea in front of Terra Nova Bay was studied. Horizontal distribution of the primary productivity shows a negative gradient across and the contribution of the picophytoplankton (2.0-0.5 microns) reaches about 60%. ^{14}C assimilation attains maximum values at the surface and minimum at 30 m, which corresponds on average to less than 1% surface light intensity. During the second cruise (Nov. 89-Jan. 90) samplings were performed from 55S to Terra Nova Bay. The maximum primary productivity was found around 60S with values of $2.77 \text{ mgC/m}^3/\text{h}$, coinciding with a probable thermohaline front as shown by an increase in salinity and a net decrease of temperature. Picophytoplankton attained 70%. In the Ross Sea, a clear decrease occurs in the assimilation of ^{14}C , while the picoplankton contribution increases (86%). In a third area defined by the stations placed on a transect at 75S the values for carbon assimilation were slightly lower than those measured in the previous area with also a lower contribution of picophytoplankton (77%). (Auth. mod.)

B-50084

Iriarte, J., et al, **Size fractionated primary productivity in antarctic coastal waters** [Estudio preliminar de la productividad primaria fraccionada por tamaño en las aguas costeras de la Antártica], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.285-288, In Spanish with Italian and English summaries. 11 refs.

According to previous studies, the antarctic oceanic nanoplankton (<20 microns in diameter) forms an important part of the photosynthetic fraction, generating between 68% and 97% of the total primary productivity. This work deals with fractionated information from 4 coastal stations in the South Shetland Is. Samples taken in Feb. 1990 from Deception I., Chile Bay and McFarlane and Morton straits show that the specific composition was dominated by *Cryptomonas* sp. and *Pyromonas* sp. in the first locality. In the other three, diatoms of the genera *Nitzschia*, *Chaetoceros*, *Thalassiosira*, *Rhizosolenia* and *Corethron criophyllum* dominated. Total primary productivity in the 4 stations ranged from 0.10 to $2.22 \text{ mgC/m}^3/\text{h}$. The larger values were for Deception I. and Morton Strait. In these localities the net phytoplankton made up 62% of the total productivity. In Chile Bay and McFarlane Strait, this figure was 75%. (Auth. mod.)

B-50085

Saggiomo, V., Massi, L., Modigh, M., Innamorati, M., **Size-fractionated primary production in Terra Nova Bay (Ross Sea) during the austral summer (1989-90)**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.289-294, With Italian and Spanish summaries. 12 refs.

In the summer of 1989-90 a series of temporal measurements of primary productivity and of chlorophyll pigments were carried out in Terra Nova Bay. Production levels were high, with values up to $1,119 \text{ mgC/m}^2/\text{d}$ in the 0-50 m layer, placing Terra Nova Bay among the most productive areas of the antarctic ocean. The study was carried out within the framework of the Italian Antarctic National Research Program, Second Italian Oceanographic Expedition, 1989-90; Ecology of Phytoplankton. (Auth.)

B-50086

Guglielmo, L., **Zooplankton and micronekton studies in Terra Nova Bay** [Le ricerche sullo zooplancton e micronekton nel P.N.R.A.], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.297-307, In Italian with Spanish and English summaries. 7 refs.

Zooplankton and micronekton studies were carried out in Terra Nova Bay in the summer of 1987-1988, and in the Pacific Ocean between New Zealand and Antarctica in 1989-1990. The sampling gear used in both expeditions was the EZNET BIONESS (0.5 m x 0.5 m), a multinet electronic system equipped with 10 nets having a 240 micron and 500 micron mesh size and sensors for the continuous monitoring of depth, temperature, salinity, oxygen, pH, light attenuation and fluorescence. During the first expedition, 314 samples were collected in Jan. and Feb. The preliminary results indicate that biomass values are generally poor, with a low number of dominating species including *Limacina helicina*, *Euphausia crystallorophias*, *Metridia gerlachei* and *Calanoides acutus*. In the second expedition, the 572 samples collected to a 1,000 m depth present interesting results with regard to the species structure and distribution patterns in areas of convergence or those covered with pack ice. (Auth. mod.)

B-50087

Marín, V., **Antarctic zooplankton: perspectives for future studies** [Zooplancton antártico: perspectivas para un estudio futuro], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.309-313, In Spanish with Italian and English summaries. 10 refs.

This essay, resulting from the author's experience, consists of an analysis of present trends in antarctic research. Notwithstanding the high seasonality of the antarctic ecosystem, only the summer characteristics of the zooplankton are known, with emphasis on krill. The present state of research carried out separately by scientists from different countries suggests the need for wide-ranging cooperative programs to test various hypotheses on the life cycle of plankton within an annual time span. To this end, the study of existing but not analyzed collections would also help. (Auth. mod.)

B-50088

Ghirardelli, E., **Antarctic and periantarctic plankton: the Chaetognaths** [Il plancton dell'Antartide e delle aree periantartiche: i Chetognati], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.315-318, In Italian with Spanish and English summaries. 12 refs.

Chaetognaths are distributed in all the oceans and seas. There are about 100 species described; of these, about 10 are present in the plankton of Antarctica and periantarctic waters. They constitute one of the most interesting components, showing some aspects of morphology and biology of this plankton. Some species are very rare. (Auth.)

B-50089

Azzali, M., Kalinowski, J., **Italian antarctic acoustic survey of krill**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.321-330, With Italian and Spanish summaries. 9 refs.

Problems associated with collecting data on krill are of a logistic, biologic and acoustic nature. The seemingly simplifying assumption underlying the BIOMASS program was that krill was absent from the South Pacific Ocean. However, the first acoustic survey in the Ross Sea has not confirmed the above assumption. The mean area density of krill in the Ross Sea is similar to the one estimated for the Indian Ocean sector. During the expedition, only swarms and irregular formations were detected in the continuous daylight. No significant diurnal vertical migrations of aggregations were observed. This confirms the important role of light, both in cohesive forms and in diurnal vertical migrations. The occurrence of numerous and dense aggregations in areas some weeks before being covered by pack-ice suggests that krill aggregations occur both in the open water and below the ice. Visual observations of high concentrations of predators (mainly birds) near krill aggregation confirm the fundamental role of krill in the Ross Sea food web. (Auth.)

B-50090

Azzali, M., Kalinowski, J., Castagnani, R., **Biomass of krill in the Ross Sea (Pacific sector) in relation to BIOMASS FIBEX/SIBEX results**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.331-338, With Italian and Spanish summaries. 6 refs.

Results of hydroacoustic investigations on krill biomass, carried out in the Ross Sea between Dec. 1989 and Jan. 1990, are presented. A mean biomass of 1.76 g/m² was measured. The highest values of 135 g/m² were recorded in the central part of the surveyed area between 70S and 72S. A total biomass of krill of 452,000 tons was estimated. The results are compared with those from the BIOMASS program. It was found that the mean biomass from the Indian sector and the Ross Sea were similar. (Auth.)

B-50091

Arnaud, P.M., **State of the art in antarctic benthic research**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.341-345, With Italian and Spanish summaries. 23 refs.

The composition and distribution of antarctic macrobenthic fauna are relatively well known down to a few hundred meters, but not at greater depths. The knowledge of antarctic meiobenthic fauna is even more limited at any depth. Studies in close connection with research on the adaptation of key species (biology and physiology) and synecology of representative communities and depth zones (structure and function). Potentially rewarding objectives are identified for each of these fields. This is done on the basis of what is already known, and with consideration of what is most likely to contribute to a better understanding of the current antarctic benthic ecosystem and of its evolution. The knowledge about the antarctic benthos has already been reviewed at three characteristics levels: the taxonomical/biogeographical level, the synecological level and the adaptational/historical level. Since a reasonably comprehensive understanding can be obtained through these reviews, the present paper focuses on the gaps in this knowledge. Selective objectives are suggested to contribute to an efficient and rewarding orientation of benthic research in antarctic and subantarctic waters. (Auth. mod.)

B-50092

Di Geronimo, S., **Benthos: preliminary report** [Benthos: rapporto preliminare], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.347-352, In Italian with Spanish and English summary.

The benthos research in Terra Nova Bay focused on the following: drawing up a systematic list of the benthic flora and fauna; identification of the main benthic communities; and drawing up a preliminary map of the benthic communities. A preliminary biocoenotic scheme of the area was based on the early data obtained during the Italian oceanographic expeditions of 1987-1988 and 1989-1990 austral summers. Due to the long persistence of marine coastal ice, the Infralittoral rocky bottoms are characterized by a vertical shift of the sciaphylic communities toward shallower depths. The Circalittoral-Pseudobathyal boundary is placed at about 75 m in depth, coinciding with the disappearance of the encrusting *Melobesia Clathromorphum lemoineanum*. Within the different zones, further subdivisions were tentatively drawn by means of Bryozoans, Polychaetes and Foraminiferans. (Auth. mod.)

B-50093

Violanti, D., **Foraminifera from Terra Nova Bay (Antarctica) 1987-88**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.353-357, With Italian and Spanish summaries. 7 refs.

Living and dead foraminifera obtained during the oceanographic expedition of 1987-88 in sediments from Terra Nova Bay show assemblages controlled by depth and by the dissolution of calcite. Four associations are distinguished; only the first (220 m) contains specimens with calcareous shells (*Cibicides lobatulus*), living and dead. The other assemblages (down to 1,100 m) seem to be below the calcite dissolution depth and have been differentiated on the basis of the frequency of some species

(*Miliammina earlandi*, *bathysiphon* cf. *arenaceous*, etc.). In this biocenosis, living specimens with calcareous shells are rare; the thanatocoenoses consists almost exclusively of forms with agglutinated shells. (Auth.)

B-50094

Rosso, A., **Bryozoa from Terra Nova Bay (Ross Sea, Antarctica)**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.359-369, With Italian and Spanish summaries. 24 refs.

A study of the Bryozoan fauna collected during the 1st Italian Oceanographic Expedition (1987-1988) is reported. A total of 110 bryozoan species and 11 zoarial growth forms were found in Terra Nova Bay sediments. Three groups of samples containing different associations of species and colonial forms are distinguished. The first group comprises samples collected on rocky substrata between 4 and 35 m depth. It is characterized by a sharp homogeneity, by a low number of species and by the nearly exclusive presence of the membraniporiform zoarial growth. The second group, represented by samples collected on soft substrata between 200 and 700 m, shows the richest and most diversified bryozoan fauna. All the zoarial types are present, but the membranipora is always dominant. The third group, comprising samples collected from soft substrata between 700 and 1,000 m, shows only a low number of bryozoan species and specimens. Among zoarial forms, erect growth types are dominant. (Auth. mod.)

B-50095

Cantone, G., Sanfilippo, R., **Polychaeta from Terra Nova Bay (Ross Sea, Antarctica)**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.371-381, With Italian and Spanish summaries. 10 refs.

Polychaeta communities from sites sampled during the 1st Italian Oceanographic Antarctic Expedition (1987-1988) were studied. Of nearly 600 specimens of "Sedentaria" polychaeta collected in Terra Nova Bay, 55 species and 17 families were identified. The greater part of polychaeta fauna is endemic to the Antarctic and the subantarctic. On the basis of bathymetric distribution, 5 groups of polychaeta were distinguished from near shore to 1,000 m. The fauna is not uniformly distributed on the sea floor; 2 bathymetric belts contain most of it. The microstructure of the calcareous serpuloid tubes were analyzed by scanning electron micrographs; photographs of both tubes and their sections are shown. (Auth. mod.)

B-50096

Gallardo, V.A., **Benthos of shallow bays of the South Shetland Is.** [Estudios bentónicos en bahías someras antárticas del archipiélago de la Islas Shetland del Sur], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.383-393, In Spanish with Italian and English summaries. Refs. p.390-393.

A brief review is presented of the main contribution by Chilean scientists to benthic research, which began in 1967 and has focused on macrofaunal communities in shallow bays of the South Shetlands. Particular attention was paid to the environmental impact of volcanic eruptions on Deception I. Other studies involved the taxonomy of different benthic groups and ecological relationships between demersal fish and the benthos. (Auth. mod.)

B-50097

Cormaci, M., Furnari, G., Scammacca, B., Casazza, G., **Study of Terra Nova Bay phytobenthos and population zonation** [Il fitobenthos di Baia Terra Nova (Mare di Ross, Antartide): osservazioni sulla flora e sulla zonazione dei popolamenti], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.395-408, In Italian with Spanish and English summaries. 26 refs.

The results of a floristic and vegetational study on benthic phytoenoses from Terra Nova Bay are presented. The flora consists of 9 rhodophyceae, 4 phaeophyceae and 4 chlorophyceae. The most interesting species from a phytogeographic point of view are *Gymnogongrus antarcticus*, *Ballia sertularioides*, *Petroderma maculiforme* and *Syringoderma* sp. The study identified 4 zones: the supralittoral, midlittoral,

infralittoral and circalittoral. The first zone is characterized by diatoms and cyanophyceae; the second, by a community of *Urospora penicilliformis*, the infralittoral, in which 2 levels can be distinguished, is characterized by a community of *Iridaea cordata* and *Monostroma harti* in the upper level, and by a community of *Phyllophora antarctica* in the lower; the circalittoral is characterized by a community with encrusting algae, among which *Clathromorphum lemoineanum* is the most abundant. (Auth.)

B-50098

Gambi, M.C., Mazzella, L., **Quantitative and functional studies on coastal benthic communities of Terra Nova Bay (Ross Sea, Antarctica): hard bottoms**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.409-415, With Italian and Spanish summaries. 19 refs.

An overview of some of the structural and functional aspects of coastal rocky bottom benthic communities of Terra Nova Bay is presented. Data obtained in the summer of 1989-1990, from sampling along a rocky wall at 0.5, 2, 6, 12 and 16 m depth, covered benthic diatom microflora, microalgal biomass, and density and distribution of various animal taxa and their community structure and trophic categories. *Iridaea cordata* and *Phyllophora antarctica* are 2 species of macroalgae with the highest biomass values. The animal community has few species but high abundance along the transect, with a smaller number of species in shallower waters. The deeper populations associated with *P. antarctica* are richer and more diversified, with occurrence of rissoid molluscs, isopods and polychaetes.

B-50099

Wägele, J., Brandt, A., **Aspects of the biogeography and biology of antarctic isopods (Crustacea)**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.417-420, With Italian and Spanish summaries. 22 refs.

The biogeography of the antarctic isopods (crustacea) is discussed. A comparison of distribution data with phylogeny indicates that at least the serolidae and the arcturidae originate from an archaic fauna that must have existed in a cold-temperate Gondwana province. Vicariance by continental drift, subsequent radiation on the shelf of isolated Antarctica, northward migration, submergence and emergence are mechanisms that produced the present fauna. The hitherto studied species belong to different trophic levels; the isopoda cannot be placed as a single entity in a scheme of the benthic food web. (Auth.)

B-50100

Sieg, J., **On the origin and age of the antarctic tanaidacean fauna**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.421-429, With Italian and Spanish summaries. Refs. p.428-429.

The antarctic shelf is characterized by a tanaidacean species composition which is atypical compared to other zoogeographic regions. As the analysis of the fossil records shows, all Recent families had evolved before the Eocene and therefore had the chance of colonizing the antarctic shelf area. Nevertheless, the tanaidacean fauna of this region is represented exclusively by phylogenetically young taxa. In general, the species composition is more like that of the deep sea. For the interpretation of the recognized distribution patterns, most important are geological events and the resulting effects on the changes in world climate. Therefore, it is assumed that the Recent antarctic crustacean fauna was established mainly about 38 m.y.a. after the separation of Australia from Gondwana, which was followed by a dramatic drop of temperature within a very short time. Cold stenothermic eurybathic species than colonized the antarctic shelf. After the phase of maximal glaciation the fauna of West Antarctica was finally modified by magellanic elements, which in some cases have been accepted as phylogenetically old forms. As these elements have reinvaded that area, they cannot be considered as relict species. (Auth.)

B-50102

Battaglia, B., **Genetic differentiation mechanisms in subantarctic regions** [Mecanismos de diferenciación genética en regiones subantárticas], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro

EULA—Chile, 1992, p.439-442, In Spanish with Italian and English summaries. 3 refs.

Advanced oceanographic research is revealing high levels of physical and biological heterogeneity in the marine environment. Nowadays this is viewed as a much more discontinuous and diversified habitat than was believed in the past, and therefore endowed with those prerequisites necessary for the evolutionary process. From this viewpoint, areas of special interest are some ecologically marginal sites such as estuaries and brackish water lagoons, the deep sea, certain 'transitional' areas where masses possessing different features come into contact, and regions such as the polar ones which can be considered ecologically extreme. In terms of genetic diversification and underlying mechanisms, special attention should be given to subantarctic regions close to the Antarctic Convergence. The main results of recent research conducted on the Kerguelen Is. and in the Magellan Strait are briefly reported. (Auth.)

B-50103

Battaglia, B., et al, **Genetic distance evaluation in the amphipod *Paramoera* from the Antarctic and the Subantarctic** [Misure di distanza genetica in anfipodi del genere *Paramoera* di area antartica e subantartica], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.523-527, In Italian with Spanish and English summaries. 8 refs.

Due to its particular features the antarctic zone is very suitable for evolutionary research. The analysis and comparison of genetic structures of antarctic and subantarctic populations belonging to 4 species of the amphipod *Paramoera*, have been carried out in order to reach a better understanding of differentiation and speciation patterns and mechanisms. Antarctic populations of *P. walkeri*, collected from sites not far from each other, exhibited the expected high level of affinity, whereas subantarctic populations of *P. austrina* appear separated by genetic distances normally occurring between different sub-species. Genetic data suggest the existence of 2 different evolutionary pathways related to geographic distribution: one of them followed by the 2 species occurring both in Antarctica and in the subantarctic (*P. walkeri* and *P. austrina*); the other by species living only in subantarctic areas (*P. fissicauda* and *P. parva*). (Auth.)

B-50108

Miya, M., ***Cyclothone kobayashii*, a new gonostomatid fish (Teleostei: Stomiiformes) from the southern ocean, with notes on its ecology**, *Copeia*, Feb. 1, 1994, No.1, p.191-204, 36 refs.

Among the other 12 currently recognized *Cyclothone* species, *C. kobayashii* is most similar to *C. pseudophallida* but is readily distinguished from it by the absence of the following internal sagittal pigmentation: patches of pigment between successive neural spines anterior to dorsal-fin origin; punctate/dispersed melanophores along spinal cord; and streaks of pigment along neural and hemal spines. The higher VC photophore counts also are useful in distinguishing these two species, whereas other meristic characters overlap each other to varying degrees. *C. kobayashii* is abundant in the southern ocean around 35-45S, its range extending southward to 60-65S and northward to 25-35S. It is replaced by *C. pseudophallida* in the more northerly latitudes, and the two species occasionally occur together between 25S and 35S. Examination of gonads from selected specimens demonstrated that reproductive characteristics of *C. kobayashii* are very similar to those of *C. pseudophallida*. On the basis of the supposed sister-group relationship between *C. kobayashii* and *C. pseudophallida*, it seems reasonable to postulate that their separate though slightly overlapping distributions have been achieved through some large scale oceanographic subdivision of their common circumglobal ancestral population. A revised key is provided for *Cyclothone* of the southern ocean and adjacent waters south of 30S. (Auth. mod.)

B-50110

Chapuis, J.L., Boussès, P., Barnaud, G., **Alien mammals, impact and management in the French subantarctic islands**, *Biological conservation*, 1994, 67(2), p.97-104, 52 refs.

The unique plant and animal communities of the French subantarctic islands have been greatly modified by the introduction of mammals since their discovery in 1552 and 1772. Nine species, wild and domestic, thrive due to a lack of competitors, predators and diseases, and despite the small number of founders. Herbivores have induced significant changes to the

nature and structure of plant communities and carnivores have modified burrowing petrel Procellariidae populations and species diversity. Introductions are now prohibited. Research programs have been developed to study the population biology, and measures are being taken to control or eradicate alien species populations. Control programs are effective for rabbits *Oryctolagus cuniculus* on the Kerguelen archipelago and cattle on Amsterdam I. Planned programs deal with cat, mouflon and sheep in the Kerguelens. (Auth.)

B-50111

Downes, M.T., Hrstich, L., Vincent, W.F., **Extraction of chlorophyll and carotenoid pigments from antarctic benthic mats for analysis by HPLC**, *Journal of applied phycology*, Dec. 1993, 5(6), p.623-628, 7 refs.

The efficiency of 9:1 acetone-water, DMSO and boiling 9:1 ethanol-water in extracting chlorophyll and carotenoid pigments from benthic cyanobacterial mats from Antarctica for HPLC (high performance liquid chromatography) analysis was examined. Considerable breakdown of chlorophyll *a* was observed after 5 min extraction in boiling ethanol and 2 h extraction in DMSO. Over 50% of the chlorophyll *a* was degraded to chlorophyllide *a* and there was substantial loss of carotenoids after a 15 h exposure of ground cells to cold 9:1 acetone-water. Mild sonication of ground mat material in 9:1 acetone-water, followed by a 4 h extraction at 4 C, was found to minimize chlorophyll *a* breakdown, and dramatically improved the extraction efficiency of chlorophyll *a*, myxoxanthophyll and B-carotene. (Auth.)

B-50115

Loeb, V.J., et al, **Antarctic larval fish assemblages: a review**, *Bulletin of marine science*, Sep. 1993, 53(2), p.416-449, Refs. p.444-448.

Larval fish assemblages are considered within the context of the unique ichthyofauna which evolved in antarctic waters as a result of environmental cooling, glaciation, and isolation by the antarctic polar front. Existing information on the larval fish assemblages is summarized. Distribution patterns of known assemblages in continental and island shelf areas are related to those of the adult stocks and to hydrographic features affecting dispersal of the component species. Finer scale distribution patterns of larval fish assemblages in relation to hydrographic conditions within areas of the Antarctic Peninsula, the Weddell Sea, and South Georgia are described. (Auth.)

B-50130

Jenkins, D.G., **Evolution of the Cenozoic southern high- and mid-latitude planktonic foraminiferal faunas**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.175-194, Refs. p.192-194.

The distribution of living species of planktonic foraminifera and the relationship of species diversity to temperature are reviewed with special reference to the southern ocean. The average duration of the 28 extant species recorded by Bé (1977) is 10.4 m.y. with the longer surviving species in the cooler waters of 0-10 C; there is a progressive increase in the durations from 8.1 m.y. in the Tropical Province to 24.5 m.y. in the low-diversity Polar and Subpolar Faunal provinces. These data are compared with an average duration of 7.1 m.y. in both the Cenozoic Tropical-Subtropical Province and the southern mid-latitude province. A sequence of Cenozoic paleoenvironmental changes in the southern ocean is discussed, including glaciations in Antarctica. Of great significance to the faunas was the initiation of the circum-antarctic current in the Early Oligocene at 31 Ma, when the two ocean systems around Antarctica became connected and merged to form the southern ocean. Early Paleocene taxa of the southern ocean south of 50S were part of a Temperate Fauna, and these were replaced in the Late Paleocene and Early Eocene by subtropical faunas. For the remaining Middle and Late Eocene, temperate faunas returned to these high latitudes punctuated by brief incursions of warmer faunas from the north. (Auth. mod.)

B-50137

Eastman, J.T., Hikida, R.S., DeVries, A.L., **Buoyancy studies and microscopy of skin and subdermal extracellular matrix of**

the antarctic snailfish, *Paraliparis devriesi*, *Journal of morphology*, 1994, Vol.220, p.85-101, Refs. p.100-101.

The antarctic snailfish *Paraliparis devriesi* (Liparididae) occupies an epibenthic habitat at a depth of 500-650 m in the subzero waters of McMurdo Sound. Although lacking a swim bladder, this species is neutrally buoyant through the combined effects of reduced skeletal ossification and expansion of a watery gelatinous subdermal extracellular matrix (SECM). The SECM serves as a low density buoyancy agent. It comprises a mean of 33.8% of the body weight, the largest known proportion of any adult fish. The SECM is loose connective tissue dominated by ground substance consisting of glycosaminoglycans, especially hyaluronic acid, and immobilized water. Although the SECM is 97% water, elevated levels of NaCl provide an osmotic strength greater than that of other body fluids. Only small amounts of antifreeze compounds have been identified in *P. devriesi*; therefore, freezing avoidance may result from the combined effects of antifreezes and the elevated osmolality of body fluids. The skin overlying the SECM is thin (85-200 microns) and loose, and unlike most other fishes, the epidermis is several times thicker than the dermis. The midepidermis has a distinctive layer of vacuolated club cells of unknown function. Light and electron microscopy indicate that the skin is unspecialized for protection against entry of ice. (Auth.)

B-50143

Broady, P.A., Ingerfeld, M., **Three new species and a new record of chaetophoracean (Chlorophyta) algae from terrestrial habitats in Antarctica**, *European journal of phycology*, Feb. 1993, 28(1), p.25-31, 25 refs.

Descriptions are provided of cultured isolates of four species of chlorophyte microalgae which would traditionally be assigned to the Chaetophoraceae, Leptosiroideae (*sensu* Bourrelly, 1990). Light microscope observations are supplemented by electron microscopy, particularly of pyrenoid features. Three new species are described: *Cocobotrys mucosus* sp. nov., *Dilabifilum prostratum* sp. nov. and *Desmococcus endolithicus* sp. nov. *Desmococcus olivaceus* is a new record for Antarctica. Diagnostic features of the new species include extensive gelatinization of cell walls in old cultures of *C. mucosus*, growth of a well-developed pseudoparenchymatous prostrate system in liquid cultures of *D. prostratum*, and production of quadriflagellate zoospores by *D. endolithicus* which is a new observation for this genus. Unusual and contrasting ultrastructural features of the pyrenoid are described for *D. prostratum* and the *Desmococcus* species. The former is traversed by appressed pairs of thylakoids coated with pyrenoglobuli; the latter is traversed by single thylakoids with pyrenoglobuli surrounding the pyrenoid matrix. (Auth.)

B-50144

Petri, G., Zauke, G.P., **Trace metals in crustaceans in the Antarctic Ocean**, *Ambio*, Dec. 1993, 22(8), p.529-536, 64 refs.

To evaluate whether metal concentrations in crustaceans from the antarctic ocean may be suitable as indicators of background levels, the elements Cd, Pb, Cu and Zn were analyzed in 17 species. Samples were taken from RV *Polarstern* in the Weddell Sea and during the first German Underwater Expedition to the Antarctic Peninsula. Metal concentrations found show considerable interspecific heterogeneity without consistent dependence on higher taxa. They are not low compared to other areas, with the exception of Pb. In contrast, observed Cd levels in caridean decapods were among the highest concentrations observed in marine crustaceans. Cu and Zn concentrations are in many cases within ranges given in the literature. Extremely low Cu concentrations in the amphipod *Maxillipimedia longipes* and the isopod *Aega antarctica* support the hypothesis that certain antarctic species may show Cu deficiencies or reduced metal requirements. Therefore, antarctic organisms should not be used as the basis for global background levels in monitoring studies. Toxicokinetic experiments with organisms from the antarctic ocean are necessary to obtain more insight into accumulation strategies as a basis for a "calibration" and an interpretation of observed whole-body metal concentrations. (Auth. mod.)

B-50147

Eastman, J.T., **Antarctic fish biology: evolution in a unique environment**, San Diego, CA, Academic Press Inc., 1993, 322p., Refs. p.279-314.

DLC QL637.2.E2 1993

This book addresses aspects of the biology of antarctic fishes with emphasis on the organismal biology of notothenioids and especially on the speciose family Nototheniidae. Chapters 1-3 contain a general introduction to Antarctica and the southern ocean, a summary of the geologic and climatic history of Antarctica, and a review of the fossil fish faunas of Antarctica. Chapters 4-8 deal with the modern fish fauna, especially notothenioids. Topics include distribution, taxonomic composition, systematic relationships, and zoogeographic origins. Chapter 6 describes the general biology of notothenioids, emphasizing ecological diversification, and includes the non-antarctic members of the suborder. Chapters 9-14 focus on organismal and organ system adaptation in notothenioids. As the term is used here, adaptation means evolutionary adjustment of the morphology, physiology, and ecology to the environment. Several examples of adaptation in notothenioids are noted, with antifreeze glycopeptides probably the most striking. Chapters 12-14 cover the muscular, cardiovascular, and nervous systems of notothenioids stressing the interpretive notothenioid physiology in a phyletic and ecological context. (Auth. mod.)

B-50193

Zernova, V.V., Domanov, M.M., **Seasonal periodicity of diatoms in Admiralty Bay** [Sezonnye izmeneniia diatomovogo planktona v zalive Admiralteystva (o-v King- Dzhordzh, IUzhnye Shetlandskie ostrova)], *Antarktika*, 1993, No.31, p.159-166, In Russian with English summary. 28 refs.

Year-round studies (1987-1988) of surface diatoms in Admiralty Bay revealed considerable changes in algal composition and quantity caused by hydrological, hydrochemical and climatic factors. The following abundances are recorded: Sep., 66×10^3 cells/L and 510 mg/m^3 ; Feb., 430 cells/L and 935 mg/m^3 , and Apr., 210 cells/L³ and 377 mg/m^3 . The first outburst of ice diatoms occurred by the end of winter (Aug., 17×10^3 cells/L and 80 mg/m^3). The process of seasonal development of diatoms is characterized by a successive change of predominant species and groups of algae, usually smaller at the initial stage of development and larger by the end. This succession is especially noticeable in spring. The correlation between the quantity of cells (and biomass) of diatoms and the abiotic factors shows the lack of a stable link to the inflow of waters from the Weddell Sea and the Bellingshausen Sea. At the same time, changes in the diatom biomass during the year influence the content of organic phosphorus in the water. The level of the correlation becomes higher during periods of intensive diatom vegetation. (Auth. mod.)

B-50194

Bulavintsev, V.I., Golovkin, A.N., Denisova, A.V., **Snow petrels as ecological monitors in Antarctica** [Snezhnyĭ burevestnik kak perspektivnyĭ ob'ekt kompleksnogo ekologicheskogo monitoringa v Antarktike], *Antarktika*, 1993, No.31, p.167-178, In Russian with English summary. 23 refs.

To substantiate the proposed use of the snow petrel *Pagodroma nivea* (Forster) in ecological monitoring in Antarctica, data on circumpolar localization of breeding sites and the total number of circumpolar population of breeding and non-breeding birds are presented. A thorough analysis of *P. nivea* reproductive cycle (beginning with feeding of nestlings up to fledging) in East Antarctica, and the interrelations of these birds with skuas, is made. Within the framework of complex ecological monitoring, a program of biological observations on *P. nivea* population in the continental part of Bunger Hills is proposed. (Auth. mod.)

B-50195

Teshebaev, Sh.B., Troiashkin, A.A., **Saprophyte microflora contamination of Soviet coastal antarctic stations** [Sravnitel'naia otsenka obsemenennosti saprofitnoi mikroflory territorii pribrezhnykh sovetskikh antarkticheskikh stantsii], *Antarktika*, 1993, No.31, p.179-184, In Russian with English summary. 16 refs.

A comparative sanitary bacteriologic analysis of allochthonic microflora contamination of Soviet coastal antarctic stations has been carried out. General regularities in spreading of introduced microorganisms depending on climatic and geographic location, and intensity of human activity at the stations and the adjacent areas, have been shown. A number of specific changes in microbiocenoses, interpreted as a result of anthropogenic impact on natural ecosystems, are noted. (Auth. mod.)

B-50256

Kang, S.H., Fryxell, G.A., **Most abundant diatom species in water column assemblages from five Leg 119 drill sites in Prydz Bay, Antarctica: distributional patterns**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.645-666, Refs. p.665-666.

DLC QE39.T49b

Surface and subsurface sampling of the water column was conducted at five drill sites (Sites 739-743) and included 14 stations in Prydz Bay, from Jan. 18 through Feb. 3, 1988. The samples were taken from 7 depths at each station between the surface and 200 m, to gain quantitative information on the composition, abundance, and distribution of the diatoms in water column assemblages. Over 40 diatom species were found and two different distributional patterns were observed. Small pennate diatom species dominated at all drill sites and were distributed ubiquitously along the transect of sampling sites, while larger-celled (>20 microns) diatom species were concentrated in the inner part of Prydz Bay. Cluster analysis revealed different relationships depending on which variables were used for the analysis. When only larger-celled diatom species were included in the analysis, stations were separated clearly into those from the inner part of Prydz Bay (Sites 740 and 741) and those from the outer part (Sites 739, 742, and 743). But when only smaller-celled diatom species were used for analysis, the stations from inner and outer Prydz Bay intermingled and were not separated clearly. Diatom cell maxima were located slightly above the seasonal thermocline while chlorophyll *a* maxima were located in the thermocline, slightly below the diatom cell maxima. Vertical diatom distributions mirrored the physical structure in the bay. (Auth. mod.)

B-50257

Stockwell, D.A., Kang, S.H., Fryxell, G.A., **Comparisons of diatom biocoenoses with Holocene sediment assemblages in Prydz Bay, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.667-673, 23 refs.

DLC QE39.T49b

Quantitative and qualitative examinations of the planktonic diatom population of Prydz Bay were conducted during ODP 119. Water column production was intense, as evidenced by high concentrations of chlorophyll *a* (ranging from 40.0 to $576.5 \text{ mg Chl } a/\text{m}^2$) and by high diatom abundances (ranging from 3.76×10^{10} to 2.9×10^{11} cells/ m^2). Water column biomass was primarily dominated by three ice-related pennates: *Nitzschia closterium*, *N. cylindrus*, and *N. curta*. Together these three diatoms accounted for 64-96% of the water column assemblage. Sediment diatom assemblages mirrored this intense water column production, with valve numbers ranging from 3.4×10^7 to 6.8×10^9 valves/g sediment. The genus *Nitzschia* typically formed 70% of the diatom thanatocoenose. *N. curta* and *N. cylindrus* together accounted for 34.6- 78.3% of the total assemblage. Heavily silicified resting spores of *Chaetoceros* were also an important component of these sediments, accounting for 8-34% of the total assemblage. (Auth.)

B-50258

Fryxell, G.A., **Comparison of winter and summer growth stages of the diatom *Eucampia antarctica* from the Kerguelen Plateau and south of the Antarctic Convergence zone**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.675-685, Refs. p.680-681.

DLC QE39.T49b

On ODP Leg 119, specimens collected of *Eucampia antarctica* (Cast-racane) Mangin var. *antarctica* exhibited morphological and distribution patterns that contrasted with those of *E. antarctica* var. *recta* (Mangin) G. Fryxell et Prasad. *E. antarctica* var. *antarctica* was found over the northern Kerguelen Plateau, north of the summer Antarctic Convergence Zone, in the subpolar plankton and in sediments. *E. antarctica* var. *recta* was found close to the continent in Prydz Bay. A key feature for distinguishing the two varieties in the field is the growth habit, with curvature in broad girdle

view of the nominate subpolar variety in both the winter stage and the more lightly silicified summer stage. Cells of *E. antarctica* var. *recta* tend to be somewhat larger than in *E. antarctica* var. *antarctica*, and they form chains that are straight in broad girdle view but slightly curved in narrow girdle view. This truly polar variety shows less growth in the winter stage, with a higher ratio of terminal to intercalary valves in Prydz Bay than that of the nominate variety from the subpolar regions over the Kerguelen Plateau. (Auth. mod.)

B-50259

Thierstein, H.R., Störrlein, U., **Living bacteria in antarctic sediments from ODP Leg 119**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.687-689, 11 refs.

DLC QE39.T49b

A feasibility study was made of the shipboard determination of living microbial cell densities in deep-sea sediments using fluorescence microscopy and the DAPI staining technique. In sediments down to 38 mbsf the number of living bacterial cells per milliliter of sediment ranged from near 0 to near 10^6 , which is well within the range of microbial densities reported from aquatic and sedimentary environments elsewhere. It is suggested that this method be used on future ODP drilling cruises, where recovery of carbon-enriched ancient sediments is expected to verify the long-term diagenetic influence of living microbes in black shale sequences. (Auth.)

B-50278

Gwynn, A.M., **Clutch size in *Eudyptes* penguins**, *Emu*, Dec. 1993, 93(4), p.287-290, 19 refs.

A review is given of clutch sizes among the various penguin species. Most lay two-egg clutches but there are several frequent variants depending upon the fate of a first egg, or the laying experience or lack thereof, in the individual layers. Rockhoppers were once thought to lay three-egg clutches regularly; however, it has since been observed that Rockhoppers often steal eggs from neighboring nests, hatch them, and in all respects raise them as their own. In reviewing the possibility that Rockhoppers do regularly lay three-egg clutches, the egg size is a critical determinant. This factor is closely examined for the Rockhoppers and for those of other penguin species as well. Experience of the Macaronis is compared to that of the Rockhoppers.

B-50279

Gwynn, A.M., **Egg composition in the Macaroni penguin *Eudyptes Chrysolophus***, *Emu*, Dec. 1993, 93(4), p.290-292, 7 refs.

The *Eudyptes* penguins are unique in laying two-egg clutches in which the first (A egg) is consistently smaller than the second (B egg; Gwynn 1993). This divergence is seen in its most extreme form in the Macaroni penguin *E. chrysolophus* and Royal penguins *E. schlegeli*, in which the second egg is about 60% heavier than the first egg (Gwynn 1953).

B-50280

Greenfield, L.G., **Live Adélie penguins in antarctic dry valleys**, *Notornis*, Dec. 1993, 40(4), p.306-307, 5 refs.

A chance meeting with two Adélie penguins is described. It occurred at a field camp about 50 km from the nearest open water at McMurdo Sound and 120 km from the closest penguin colony. Both birds were emaciated and weak and soon died, apparently of starvation, since there was ample available drinking water but no food.

B-50281

Cossee, R.O., Mills, J.A., **First live record of an Adélie penguin in New Zealand**, *Notornis*, Dec. 1993, 40(4), p.308-309.

The Adélie was first noticed at a public beach in Kaikoura, apparently unperturbed by the many tourists passing by. The bird was soon moved to a more remote beach by a conservation officer. This the first known sighting of a live Adélie on a New Zealand beach.

B-50289

Campbell, W.C., Overstreet, R.M., **Historical basis of binomials assigned to helminths collected on Scott's last antarctic expedition**, *Helminthological Society of Washington. Journal*, Jan. 1994, 61(1), p.1-11, 12 refs.

Scientific investigations were a feature of Captain R.F. Scott's ill-fated expedition to the South Pole in 1910-1912. Among them was a study of parasitic worms in the coastal wildlife of Antarctica. It was the special project of Surgeon Edward L. Atkinson, whose scientific contributions, like his passion for high adventure, have largely been forgotten. The new parasitic species that he discovered were given names that were intended to honor the Expedition and many of its members. However, it was not then usual for new species descriptions to include an explanation of the proposed new binomials, and the significance of these particular names is not obvious to modern readers. This article examines the historical connection between the names of Atkinson's worms and the individuals and exploits commemorated by those names. (Auth.)

B-50290

Mauget, R., Jouventin, P., Lacroix, A., Ishii, S., **Plasma LH and steroid hormones in King penguin (*Aptenodytes patagonicus*) during the onset of the breeding cycle**, *General and comparative endocrinology*, Jan. 1994, 93(1), p.36-43, 33 refs.

Temporal changes in plasma levels of luteinizing hormone (LH), testosterone, estradiol, and progesterone were measured throughout molt and the onset of reproduction in free-living male and female King penguins in the Crozet Is. In both sexes, LH concentrations began to rise as soon as molting ended, before the departure for refeeding at sea, suggesting that the beginning of reproductive activity is not associated with refeeding and/or courtship behavior. LH remained at high values throughout courtship and decreased to lower levels during incubation. Gonadotrophin secretion covaried with sustained plasma testosterone levels in males and increased estradiol and progesterone levels (peaking at copulation) in females. (Auth.)

B-50291

Bornemann, H., Plötz, J., **Field method for immobilizing Weddell seals**, *Wildlife Society bulletin*, Winter 1993, 21(4), p.437-441, 25 refs.

Fourteen Weddell seals were anesthetized in the field by using a combination of ketamine hydrochloride (HCl), xylazine HCl, and diazepam. Narcoses were terminated with yohimbine HCl. The mean total dosage/kg body mass was ketamine 3.11 mg (SE=0.19), xylazine 0.94 mg (SE=0.04), diazepam 0.04 mg (SE=0.01), and yohimbine 0.5 mg (SE=0.02). This drug combination shortened the recovery time considerably and did not cause undesirable side effects, especially during recovery. (Auth.)

B-50292

Matzer, M., Mayrhofer, H., Scheidigger, C., **Notes on *Amandinea petermannii* comb. nov. (Physciaceae) from Antarctica**, *Lichenologist*, 1994, 26(1), p.39-46, 28 refs.

The new combination *Amandinea petermannii* (Hue) Matzer, Mayrh. & Scheidegger is proposed. The taxonomy, morphology, anatomy, chemistry, ecology and distribution of this lichen are discussed. *Rinodina convoluta* D.C. Lindsay is a synonym of *A. petermannii*. (Auth.)

B-50304

Baker, A. de C., Boden, B.P., Brinton, E., **Practical guide to the Euphausiids of the world**, London, Natural History Museum, 1990, 96p. (Pertinent p.60,61,66,67,94-96), Refs. p.94-96.

DLC QL444.M338B34 1990

The volume is a key to the Euphausiids of the world. The indicated pertinent sixth decade pages contain taxonomic data on and sketches of *Euphausia superba* and *Euphausia frigida*, the two species which flourish south of the Antarctic Convergence.

B-50311

Miller, R.G., Hastings, P.A., Gourley, J., **History and Atlas of the fishes of the antarctic ocean**, Carson City, NV, Foresta Institute, 1993, 792p., Refs. p.727-774.

DLC QL637.2.M54 1993

The finding Atlas presented here, based on confirmed oceanographic, geophysical, and paleontological evidence, should enable the recognition of any fish known from the waters of the antarctic ocean. The volume is arranged with ice habitat and ocean characteristics presented first in Part I, in order to show the geographic limits and the peculiar circumstances in which the southernmost fishes are found. The fishes form a homogeneous fauna in this distinctive environment, and their history is linked directly to the origin and evolution of the circumpolar antarctic ocean. The second part of Part I is a history of man's encounters with the icy sea and its fishes, and of the foundations for the study of the antarctic ichthyofauna. Part II follows as the main thesis of this publication, enumerating and describing the families and genera of all fishes of antarctic waters, presented with their individual species accounts. The narrative takes up with the Antarctic and its waters today but refers back to some 80 to 65 m.y. a.

B-50312

Jaya Sree, V., Sreepada, R.A., Parulekar, A.H., **Unusual giant pycnogonid (Pycnogonida-Colossendeidae) *Decolopoda qasimi* sp. nov. from antarctic waters**, *Current science*, July 1993, 65(2), p.179-181, 14 refs.

Five specimens of benthic pycnogonids collected from the southern ocean are described. Of these, two are identified as *Nymphon australis* (Hodgson) and two as *Ecleipsotherma spinosa* (Hodgson). One specimen under the class Colossendeidae is described as new to science, *Decolopoda qasimi*, sp. nov. (Auth.)

B-50319

Moisan, T.A., Fryxell, G.A., **Distribution of antarctic diatoms in the Weddell Sea during austral winter**, *Botanica marina*, Nov. 1993, 36(6), p.489-497, 40 refs.

As part of the AMERIEZ (Antarctic Marine Ecosystem Research at the Ice Edge-Zone) program, water samples were collected and analyzed for diatom species composition along 40W and 48W transects normal to a rapidly moving ice edge during mid-austral winter. The overall abundance of living diatoms was low: integrated estimates down to 150 m ranged from 1.06×10^8 to 6.03×10^8 cells/m². On both transects, there was a significantly higher number of living diatom cells in the open water compared to samples collected underneath the sea ice, although the sea ice was moving rapidly. Diversity was low: both *Fragilariopsis cylindrus* and *Fragilariopsis* spp. together accounted for an average of 59% of the total living diatoms at each station, individually averaging 29%. The distributional patterns of the dominant diatom taxa were closely related to the presence of the ice cover. The results of the study emphasize the low phytoplankton abundance during the austral winter season and the paucity of resting spores in the antarctic flora. (Auth.)

B-50320

Goeyens, L., et al, **Ammonium regeneration in the Scotia-Weddell Confluence area during Spring 1988**, *Marine ecology progress series*, Dec. 23, 1991, 78(3), p.241-252, 51 refs.

The presence of large ammonium stocks and the related enhanced quantities of microheterotrophs in the Scotia-Weddell Confluence area indicates the importance of ammonium remineralization processes there. Maximal ammonium concentrations in the marginal ice zone amounted to more than 2 micromol N/l and remineralization rates in this zone were consistently higher than those measured in the adjacent open ocean and permanently ice-covered zones. At one station, characterized by a large krill swarm, the remineralization rate was 18 nmol N/l/h; rates in the marginal ice zone generally ranged between 5 and 9 nmol N/l/h. Protozoan activity was of predominant importance for the remineralization process; only after the krill event was a very high bacterial activity observed. The presence of krill does not contribute in a direct way to the ammonium pool, but probably initiates the bacterial breakdown activity in algal debris and faecal pellets. The increased remineralization leads to enhanced availability of ammonium in the water and to decreased f-ratios for phytoplanktonic nitrate assimilation. Nevertheless, nitrate uptake represented at least 30% of inorganic nitrogen assimilation, significantly higher than values measured for oligotrophic systems. (Auth.)

B-50322

Williams, P.G., Roser, D.J., Seppelt, R.D., **Mycorrhizas of hepatics in continental Antarctica**, *Mycological research*, Jan. 1994,

98(1), p.34-36, 21 refs.

This paper describes infections by hyaline, septate fungal hyphae in rhizoids and adjacent axial cells of the foliose liverwort *Cephaloziella exiliflora* collected from two locations in continental Antarctica. Evidence is presented that the fungus in the rhizoids is an ascomycete and that the endophytic infections are mycorrhiza-like or mycothalli, refuting an earlier proposal that mycorrhizas might be absent from the Antarctic. (Auth.)

B-50325

Schloss, I., Estrada, M., **Phytoplankton composition in the Weddell-Scotia Confluence area during austral spring in relation to hydrography**, *Polar biology*, Feb. 1994, 14(2), p.77-90, Refs. p.88-90.

In late austral spring of 1988-1989, the composition of phytoplankton in relation to the distribution of hydrographic parameters was studied in 4 successive transects carried out along 49W and 47W, across the Weddell-Scotia Confluence (WSC) and the marginal ice zone. In all transects, a maximum of phytoplankton biomass was found in the WSC in surface waters stabilized by ice melting. Different phytoplankton assemblages could be distinguished. North of the Scotia Front diatoms with *Chaetoceros neglectus*, *Nitzschia* spp. and *Thalassiosira gravida* dominated the phytoplankton community. The southernmost stations of the first transect and all the stations to the south of the Scotia Front in the other transects were populated by a flagellate assemblage (with a cryptomonad, *Pyramimonas* spp. and *Phaeocystis* sp.) and an assemblage of diatoms (*Corethron criophilum* and *Tropidoneis vanheurkii* among others) associated with the presence of ice. During the last three transects, the flagellate assemblage formed a bloom in the low salinity surface layers of the WSC zone. The relationships between the distribution of the different assemblages and the hydrographic conditions indicate that the change of dominance from diatoms to flagellates in the WSC zone was related to the presence of water masses of different origin. (Auth. mod.)

B-50326

Voronina, N.M., Kosobokova, K.N., Pakhomov, E.A., **Composition and biomass of summer metazoan plankton in the 0-200 m layer of the Atlantic sector of the Antarctic**, *Polar biology*, Feb. 1994, 14(2), p.91-95, 24 refs.

Composition of the metazoan plankton was studied during R.V. *Dmitriy Mendeleev* cruise 43 (Feb.-Apr. 1989). At all stations 3 different sampling gears were used to collect different size groups of zooplankton. Hauls were performed by 200 liter water-bottle, mesoplankton net and macroplankton trawl for depths from 200 m to the surface. The average biomass of zooplankton in open oceanic waters was 20.55 g/m² wet weight. Copepoda Calanoida dominated, comprising 54.8% of the total plankton, followed by Euphausiacea (19.8%), Ctenophora (9.7%) and Copopoda Cyclopoida (7.2%). Biomass of any other taxonomic group was less than 1 g/m². The relative biomass of Calanoida had a tendency to decrease southward. The relative biomass of Euphausiacea increased in the same manner from 2.3 to 17.8% in Feb. and from 3.7 to 41.6% in Mar.-Apr. The average biomass of calanoids from Feb. to Mar.-Apr. decreased from 77.3 to 31.2% while that of euphausiids increased from 6.2 to 33.8%. The contribution of copepods and euphausiids to the production of the plankton community in the Antarctic is discussed. (Auth. mod.)

B-50327

Terhune, J.M., Burton, H., Green, K., **Weddell seal in-air call sequences made with closed mouths**, *Polar biology*, Feb. 1994, 14(2), p.117-122, 17 refs.

Weddell seals near Davis Station produce a number of in-air vocalizations during the breeding season. With mouth and nostrils closed, pups and adults of both sexes produce at least 8 call types. Many of these are similar in nature to the sounds made underwater. Calls range from long, high frequency (>5 kHz) whistles to short, low frequency (<0.2 kHz) grunts. Individual call elements are often repeated and up to 6 call types may be strung together in highly variable sequences. (Auth.)

B-50328

Weimerskirch, H., Robertson, G., **Satellite tracking of light-mantled sooty albatrosses**, *Polar biology*, Feb. 1994, 14(2), p.123-126, 22 refs.

Five light-mantled sooty albatrosses breeding at Macquarie I. were tracked with miniaturized satellite transmitters during foraging trips of the incubation period. Birds moved rapidly to specific sectors of the southern ocean, where they spent several days foraging before returning to their nests. These specific sectors were at an average distance of 1516 km from Macquarie I. and located in pelagic antarctic waters, mostly along the antarctic continent. The maximum foraging range was in average 1721 km and the total distance covered by two birds for which there were complete tracks was 6463 and 6975 km. This study confirms previous suggestions that light-mantled sooty albatrosses are able to forage in the waters of the high antarctic while breeding in the subantarctic. The implications of the extreme separation of feeding zones from nesting grounds, in terms of conservation and life-history strategies, are discussed. (Auth.)

B-50329

Tilzer, M.M., Gieskes, W.W., Heusel, R., Fenton, N., **Impact of phytoplankton on spectral water transparency in the southern ocean: implications for primary productivity**, *Polar biology*, Feb. 1994, 14(2), p.127-136, Refs. p.135-136.

Spectral water transparency in the northern Weddell Sea was studied during spring. The depth of the 1% surface irradiance level ("euphotic depth") varied between 35 and 109 m and was strongly influenced by phytoplankton biomass. Secchi depths were non-linearly related to euphotic depth. In phytoplankton-poor water, the most penetrating spectral region was restricted to a relatively narrow waveband in the blue (488 nm), but the range was broader, between 488 and 525 nm, when phytoplankton were abundant. Water transparency in the red spectral range was always low and only to a small extent affected by phytoplankton. Two independent procedures were used to quantify the impact of phytoplankton on spectral water transparency: regression analysis of spectral *in situ* vertical light attenuation coefficients in the sea, and coincident chlorophyll concentrations. At the highest phytoplankton biomass observed, as much as 70% of underwater light was available for phytoplankton photosynthesis. When phytoplankton were scarce, <10% of underwater light was harvested by phytoplankton. (Auth. mod.)

B-50330

Loretsen, S.H., Rørv, N., **Sex determination of antarctic petrels *Thalassoica antarctica* by discriminant analysis of morphometric characters**, *Polar biology*, Feb. 1994, 14(2), p.143-145, 24 refs.

The authors present data on sexual dimorphism in some morphological measurements (wing length, head length, bill depth and bill length) in the antarctic petrel. Males were on average larger than females for all measurements. Sexual dimorphism was on average largest for bill depths whereas wing lengths varied least between the sexes. A discriminant function including bill depth, head length and wing length correctly sexed 92% of the sample. Due to between-measurer variation it is recommended that morphometric measurements obtained by others on sexed birds be compared with these before proceeding with the use of the discriminant function on unsexed individuals. (Auth.)

B-50360

Sullivan, C.W., Fritsen, C.H., Mordy, C.W., **Microbial production in the antarctic pack ice: time-series studies at the U.S.-Russian drifting ice station**, *Antarctic journal of the United States*, 1992, 27(5), p.113-115, 20 refs.

The major objective of the biological component of the Ice Station Weddell 1 (ISW) was to test if a substantial fraction of southern ocean primary and secondary bacterial production is derived from microbial communities colonizing pack-ice and the underlying water column. Three study sites (sites A, B, and J) characterized by different ice types were established on the ISW-1 floe. A figure shows the distribution of total photosynthetic pigment concentrations along profiles of the initial ice cores collected at each of the three time series sites. At each site a distinctly different pattern can be recognized. At sites A and J the highest concentration of pigments were located near the bottom of the core at the ice-seawater interface, while at site B, the highest pigment concentration occurred as an interior band between 5 to 15 cm from the snow-ice interface. If microbial communities were growing *in situ* and contributing to primary production in the pack ice, one would expect to observe an accumulation of algal and bacterial biomass at these sites as a function of time, in part because the pack provides a refuge for these microorganisms. (Auth. mod.)

B-50364

Van Oppen, M.J.H., et al, **Tracking dispersal routes: Phylogeography of the Arctic-Antarctic disjunct seaweed *Acrosiphonia arcta* (Chlorophyta)**, *Journal of phycology*, Feb. 1994, 30(1), p.67-80, 71 refs.

Phylogenetic relationships in the Arctic-Antarctic disjunct seaweed species *Acrosiphonia arcta* (Dillwyn) J. G. Agardh (Acrosiphoniales, Chlorophyta) were examined using restriction fragment-length polymorphism analysis of the fast-evolving nuclear ribosomal intergenic spacer (IGS) region and random amplified polymorphic DNA (RAPD) markers. Twenty-two isolates collected from 10 different locations in both hemispheres were compared. Five IGS length classes were identified among the 10 locations. Throughout the North Atlantic, IGS regions were found to be extremely homogeneous whereas RAPD patterns revealed subdivided populations that suggest founder effects. Recolonization of the Antarctic Peninsula from Southern Chile is favored, whereas the directionality of transequatorial passage along the western coast of the Americas could be in either direction. (Auth. mod.)

B-50367

Wanless, S., Harris, M.P., **Use of mutually exclusive foraging areas by adjacent colonies of Blue-eyed Shags (*Phalacrocorax atriceps*) at South Georgia**, *Colonial waterbirds*, 1993, 16(2), p.176-182, 28 refs.

The areas used for feeding by Blue-eyed Shags (*Phalacrocorax atriceps*) in two colonies 2.5 km apart were determined using radio telemetry. Foraging range was extremely limited, with most birds feeding within 1 km of their colony. There was no overlap in feeding areas between the two colonies despite their proximity. Significant inter-colony differences in dive duration, maximum dive depth, and diet were found, but timing of breeding, chick growth rate, and reproductive output were similar. These results provide support for Cairns' (1989) hinterland model for the regulation of seabird colony size. (Auth.)

B-50368

Amat, J.A., Viñuela, J., Ferrer, M., **Sexing Chinstrap Penguins (*Pygoscelis antarctica*) by morphological measurements**, *Colonial waterbirds*, 1993, 16(2), p.213-215, 12 refs.

The authors applied discriminant analysis to morphometric data from Chinstrap penguins to obtain a function that can be used to predict sex. The function correctly classified 95% of 55 individuals. Bill depth was the most important discriminating variable, with males having deeper bills. (Auth.)

B-50370

De Broyer, C., Jazdzewski, K., **Contribution to the marine biodiversity inventory. A checklist of the Amphipoda (Crustacea) of the southern ocean**, *Documents de Travail de l'Institut royal des Sciences naturelles de Belgique*, Dec. 1993, No.73, 154p., Refs. p.120-135.

A checklist, with synonymical bibliography, of all benthic, supralittoral and pelagic Amphipoda (Gammaridea, Caprellidea and Hyperiidea) occurring in the southern ocean has been drawn up, mostly from taxonomical literature checked until Dec. 31, 1992. Eight hundred eighty-three taxa have been recorded: 711 spp. and subspp. of Gammaridea, 28 spp. of Caprellidea, 69 spp. and subspp. of Hyperiidea as well as 75 unidentified spp. (73 Gammaridae, 2 Caprellidae). Distribution in the east or west antarctic sub-regions, in the subantarctic islands sub-region, in the Magellanic sub-region and in the Tristan da Cunha district is covered. Bathyal and abyssal benthic occurrence is indicated as well as the general bathymetrical distribution of the pelagic species occurring south of 45S. The Barnard & Barnard (1983) coded geographic system for reporting distribution of taxa is revised for the southern ocean and a new list of geographic codes of general application for antarctic and subantarctic benthos is provided. The benthic Amphipod fauna of the southern ocean comprises 702 species (85% endemic) of which 451 are distributed in the antarctic region (78.4% endemic) and 342 in the subantarctic region (50.8% endemic). Endemicity at the genus level attains 36.7% for the whole southern ocean, 26.2% for the antarctic and 13.5% for the subantarctic region. (Auth.)

B-50379

Culik, B.M., Bannasch, R., Wilson, R.P., **External devices on penguins: how important is shape?**, *Marine biology*, Feb. 1994, 118(3), p.353-357, 25 refs.

Many researchers use external recording or transmitting devices to elucidate the marine ecology of fish, mammals and birds. Deleterious effects of these instruments on the parameters researchers wish to measure are hardly ever discussed in the literature. Research has shown that, in penguins, volume and cross-sectional area of instruments negatively correlate with swimming speed, dive depth and breeding success, and that device color affects bird behavior. Here, a large (200 g. cross-sectional area 2100 mm²) streamlined device was attached to the lower back of Adélie penguins on Ardley I. in 1992 and its effects on bird swimming speed and energetics were measured in a water canal in Antarctica. Although the device was 10.5% of penguin cross-sectional area, swimming speed was reduced by only 8.3% and mean power input increased by only 5.6% while swimming. Although the streamlined device was five times more voluminous than one of the older units, the effect on swimming energetics could be reduced by 87%. (Auth.)

B-50380

Behrenfeld, M.J., Lee, H., II, Small, L.F., **Interactions between nutritional status and long-term responses to ultraviolet-B radiation stress in a marine diatom**, *Marine biology*, Feb. 1994, 118(3), p.523-530, Refs. p.529-530.

Influences of nutritional status on the photoinhibitory effects of ultraviolet-B radiation (UVBR:290 to 320 nm) on the specific growth rates and biomass of *Phaeodactylum tricornutum* were determined using nutrient-replete batch cultures and nutrient-limited continuous cultures. *P. tricornutum* were exposed to UVBR doses representative of current mid-latitude and ozone-depletion intensities. Smith et al. (1992) used short-term dose responses of antarctic phytoplankton to UVBR to estimate the effects of ozone depletion on primary production. However, it is unclear whether dose-response models based on short-term carbon uptake measurements are indicative of the long-term photoinhibitory potential of UVBR on phytoplankton growth and biomass. The authors' results suggest that measurable decreases in phytoplankton specific growth rates and biomass from UVBR are most likely in nutrient-rich areas of the ocean, but these parameters may not be appropriate for measuring UVBR stress in regions of nutrient limitation. (Auth. mod.)

B-50383

Attwood, C.G., Hearshaw, K.D., **Lipid content and composition of sub-Antarctic euphausiids and copepods from the Prince Edward Islands**, *South African journal of antarctic research*, 1992, 22(1-2), p.3-13, Refs. p.12-13.

The lipid content, class composition and fatty acid composition of 8 euphausiid and 2 large copepod species were investigated from samples taken in the region of the Prince Edward Is. The lipid contents of the euphausiids were low compared to congeners from higher latitudes; the copepods were richer in lipids. Surface chlorophyll-*a* in the subantarctic is low when compared to the oceanic fronts to the north and south, suggesting that this region is a less productive feeding environment for zooplankton. Most species in this region occur here at the extreme of their known ranges. *Thysanoessa vicina*, *T. macrura*, *Metridia lucens* and *M. gerlachei* were found to contain wax esters in abundance, whereas *Euphausia* spp., *Nematoscelis megalops* and *T. gregaria* stored no wax ester. The fatty acid composition points to a herbivorous diet for all specimens examined. The subtropical *T. gregaria* and *M. lucens* contained less wax ester than their congeners of antarctic origin, which presumably reflects the different feeding strategies associated with latitudinal differences. A herbivorous diet of subantarctic euphausiids would imply that the large sea bird populations of this region, which feed largely on euphausiids, end a very short oceanic food chain, although the role of microzooplankton in this food chain remains unknown. (Auth. mod.)

B-50385

Chown, S.L., Avenant, N., **Status of *Plutella xylostella* at Marion Island six years after its colonisation**, *South African journal of antarctic research*, 1992, 22(1-2), p.37-40, 20 refs.

The distribution and status of the cosmopolitan crucifer-feeding diamondback moth, *Plutella xylostella* (Lepidoptera: Plutellidae) on Marion I. is reassessed based on a short survey of host plants undertaken during the 1991 relief voyage to the island. The original (1986) and current distribution of the species is discussed in the light of a simple thought-experiment concerning colonization in windswept areas. This model indicates that successful colonization by small insects of islands in regions with high wind speeds is more likely to occur on the leeward side than on the windward side of such islands. The 1986 distribution of the diamondback moth coincides with the most likely area of colonization predicted by the model, and supports the idea of natural colonization of Marion I. by *P. xylostella*. (Auth.)

B-50386

Andrew, T.G., Hecht, T., **Feeding biology of *Acantholatris monodactylus* (Pisces: cheilodactylidae) at Tristan da Cunha and Gough Island, South Atlantic**, *South African journal of antarctic research*, 1992, 22(1-2), p.41-49., 23 refs.

The feeding biology of the fivefinger *Acantholatris monodactylus* from Tristan da Cunha and Gough I. is described. Comparison of stomach and hindgut contents indicates that stomachs are more suitable for dietary analysis in this species. It is apparent that a slight shift in diet may occur with size and season. Comparison of the diets of fishes collected at Nightingale and Gough Is. with those collected at Tristan I. indicate that locality plays an important role in determining the diet of this species. Significant differences in sea surface temperatures between Tristan da Cunha and Gough I. suggest that this physical parameter is of prime importance in regulating the availability of food items and therefore diet in *A. monodactylus*. (Auth.)

B-50388

Gon, O., Mostert, D., **Aspects of the ecology of two nototheniid fish species in the inshore zone of the sub-Antarctic Marion Island**, *South African journal of antarctic research*, 1992, 22(1-2), p.59-67, Refs. p.66-67.

The nototheniid species *Notothenia coriiceps* and *Paranotothenia magellanica* are able to coexist in the inshore zone of Marion I. by way of resource partitioning along the axes of spatial distribution, substrate, occurrence of life history stages, diel activity and diet. *N. coriiceps* was very scarce and the few specimens sampled were all adult fish four to six years old, as determined from scales. *P. magellanica* was much more abundant and its population was composed of immature fish one to three years old. Resource partitioning also forms the spatial distribution within the latter species. Fingerlings transforming to benthic life were the highest off the bottom and were loosely associated with *Desmarestia*. Juveniles were found on red algae between and under bushes of *Desmarestia* on the upper half of boulders, or inside masses of detached algal fronds. Subadults were found on the bottom, near or under large boulders. (Auth.)

B-50394

Rotert, K.R., Toste, A.P., Steiert, J.G., **Membrane fatty acid analysis of antarctic bacteria**, *FEMS microbiology letters*, 1993, 114(3), p.253-258, 18 refs.

Randomly selected strains of a bacterial collection of marine sea-ice bacteria from Antarctica were analyzed to obtain a profile of the membrane fatty acids. Results showed that short-chain saturated and unsaturated fatty acids were more common in the psychrotrophs when compared to psychrophiles. In contrast, branched-chain fatty acids were more abundant in the psychrophiles.

B-50412

Pütz, K., **Aspects of the feeding ecology of Emperor penguins (*Aptenodytes Forsteri*) and King penguins (*Aptenodytes patagonicus*)** [Untersuchungen zur Ernährungsökologie von Kaiserpinguinen (*Aptenodytes forsteri*) und Königspinguinen (*Aptenodytes patagonicus*)], *Berichte zur Polarforschung*, 1994, No.136, 139p., In German with English summary. Refs. p.121-134.

Foraging ecology of King penguins was elucidated at the onset of, and at the end of, the breeding period, using stomach temperature sensors and externally attached activity recorders. The exact time at which feeding took place and the amount ingested were ascertained. Activity recorders logged information on dive depth, swim direction, swim speed, water tem-

perature, and light intensity. Consideration of these parameters clarified the types of activity in which King penguins engaged at sea and demonstrated the extent to which such behavior was dependent on biotic and abiotic variables. Key elements included diving depths, duration, and feeding during dives; feeding time patterns; light intensity; amount of food consumed; and proximity of the Antarctic Convergence. Work on Emperor penguins took place outside the breeding season where weight loss during moult could be studied. These results were apparent: during the moult Emperor penguins lose weight at a rate of 2.8%/day; post-moult Emperors consume principally krill and fish; squid beaks may be retained in penguin stomachs for many months. (Auth. mod.)

B-50418

Norman, F.I., McFarlane, R.A., Ward, S.J., **Carcasses of Adélie penguins as a food source for south polar skuas: some preliminary observations**, *Wilson bulletin*, Mar. 1994, 106(1), p.26-34, 34 refs.

South Polar skuas take eggs and young of Adélie penguins by scavenging and predation. Carcasses of penguins near Davis Station were collected and examined for damage and tissue removal by skuas. Progression of tissue destruction and removal was used to indicate successive areas of feeding. Organs and tissues from undamaged fresh corpses were weighed to determine potential food quantities. Areas of initial attack were around the head. Subsequent damage was concentrated in the thoracic-abdominal regions, and around pelvic limb musculature. Such areas provided 19% (abdominal) and 12% (pelvic muscles) of the body mass. Because seabird eggs and chicks provide as much, if not more, energy as alternative foods (krill, fish) which require extended foraging, it is adaptive for skuas nesting near penguin colonies to forage there. (Auth.)

B-50419

Kerry, K.R., Clarke, J.R., Else, G.D., **Identification of sex of Adélie penguins from observations of incubating birds**, *Wildlife research*, 1993, 20(6), p.725-732, 11 refs.

The suggestion that sex of Adélie penguins might be assigned by observing which member of the pair (the male) takes the first long incubation shift was examined for each of the 1990-91, 1991-92 and 1992-93 breeding seasons. There was an 8- or 9-day period when more than 90% of the incubating birds were male and a 6- or 7-day period when more than 90% of the birds were female. The dates of these peak periods of male or female presence overlapped by only 2-5 days between the three seasons, but were constant to within 2 days relative to the commencement of egg laying. Peak presence of males occurred 15-21 days after the appearance of the first egg in the colony and peak presence of females after 33-36 days from this date. In all three seasons male birds could be identified with 91.8-98.6% accuracy within 15-21 days after the first sighting of an egg. The method thus provides a means of identifying the sex of Adélie penguins with an accuracy greater than 90% and is applicable to whole colonies containing several hundred pairs without recourse to continuous observations or capture of the birds. (Auth.)

B-50420

Pye, T., **Reproductive biology of the feral house mouse (*Mus musculus*) on subantarctic Macquarie Island**, *Wildlife research*, 1993, 20(6), p.745-758, 47 refs.

Reproduction of the feral house mouse was studied on subantarctic Macquarie I. and found to be seasonal. Females begin oestrus-cycling in early spring, following a minimum 3-month winter anoestrous period. By late spring all mature females are in breeding condition. Breeding is continuous through spring, summer and into autumn. Postimplantation loss occurs throughout the breeding season. Late autumn pregnancies may fail. Average litter size is 6-7 but litters as large as 10 have been found. Young born in the latter half of the breeding season attain sexual maturity at a later stage than those born in the early spring-summer period and do not come into breeding condition until the following spring. Males show a slight cyclical change in testes weight, increasing from a winter minimum to a summer maximum, but are potentially capable of breeding throughout the year. Reproductive seasonality of the female determines breeding behavior in this isolated subantarctic population. Seasonal reproduction is not well correlated with mean monthly ambient temperature, which varies by only 3 C over the year. Food availability appears constant throughout the year with little interspecific competition for food or predation on the mice. Reproduction is suppressed over the short-day winter months. The

possible interaction of photoperiod with other environmental and physiological variables in determining reproductive seasonality requires further research. (Auth.)

B-50421

Chappell, M.A., et al, **Reproductive effort in Adélie penguins**, *Behavioral ecology and sociobiology*, 1993, 33(3), p.173-182, 45 refs.

Reproductive effort in Adélie penguins breeding at Palmer Station was estimated. Data on body composition changes and metabolic rate were obtained using isotopic methods. Both males and females lost considerable mass during the initial stages of the reproductive season, but males fasted longer and lost more mass. Mass losses of both sexes consisted of 66% depot fat and 34% lean tissue. Mass and body composition remained constant once birds resumed feeding. The metabolic expenditure for the foraging necessary to accumulate the mass lost while fasting was about 63 MJ in males and 39 MJ in females. Field metabolic rates (FMR) were low during courtship and while incubating, increasing more than 2-fold when birds resumed foraging. Although mean FMR increased between incubation and the creche stage, differences between stages were small and not significant. FMR data and an energy balance model were used to estimate the cost of feeding chicks. Results suggest a maintenance FMR of about 2.7 x basal metabolism (BMR), increasing to 3.4-3.6 x BMR during the creche stage. Cumulative reproductive effort devoted to chick care does not appear to be constrained by physiological or time limitations. Instead, selection to reduce the risk of predation may prevent the evolution of increased parental care. (Auth. mod.)

B-50422

Saether, B.E., Andersen, R., Pedersen, H.C., **Regulation of parental effort in a long-lived seabird: an experimental manipulation of the cost of reproduction in the antarctic petrel, *Thalassoica antarctica***, *Behavioral ecology and sociobiology*, 1993, 33(3), p.147-150, 29 refs.

The fitness of a parent in an altricial bird species is likely to be a function of the proportion of resources allocated to offspring production in relation to the amount spent on its own survival. Reported here is an experiment on the antarctic petrel in which the costs of rearing an offspring were manipulated by placing small lead loads on the legs of one parent. The bird could then either decrease its own body reserves or reduce the food load to the chick. The manipulated birds decreased their food load and increased the feeding interval, compared with unmanipulated birds. Consequently, the rate of chick loss increased. No significant difference was found between the body weights of experimental and control birds during the experiment. (Auth.)

B-50424

Ferrer, M., Amat, J.A., Viñuela, J., **Daily variations of blood chemistry values in the chinstrap penguin (*Pygoscelis antarctica*) during the antarctic summer**, *Comparative biochemistry and physiology*, Jan. 1944, 107A(1), p.81-84, 18 refs.

Daily variations of blood chemistry were investigated during the 1990-91 antarctic summer solstice in six adult chinstrap penguins in the absence of eat-fast cycles. Four of the seven blood parameters, glucose, urea, triglyceride and cholesterol, showed statistically significant variations between samples at periods of different light intensity. Blood chemistry changes in chinstrap penguins correspond with those expected in a diurnal bird under defined light-dark cycle. In the absence of eat-fast cycle, the daily cycle of light intensity, although greatly attenuated, is the most likely timekeeper (Zeitgeber) for circadian rhythms in blood parameters of chinstrap penguins. (Auth. mod.)

B-50425

Nichols, D.S., et al, **Fatty acid composition of antarctic and temperate fish of commercial interest**, *Comparative biochemistry and physiology*, Jan. 1994, 107B(2), p.357-363, 27 refs.

The fatty acid composition of flesh from four commercial, or potentially commercial, fish species from three differing regions, the antarctic (*Chaenodraco wilsoni*), sub-antarctic (*Champsocephalus gunnari*, *Dissostichus eleginoides*) and temperate (*Latris lineata*), were determined by capillary gas chromatography, together with that of a commercially rendered oil obtained from the waste frame, skin and subcutaneous layer of *D.*

eleginoides. The flesh of all species examined contained high concentrations of polyunsaturated fatty acids (PUFA, 32.6-56.3% of total fatty acids); all species are therefore good sources of *omega*3 rich marine oils. The fatty acid composition of the oil produced from commercial rendering of *D. eleginoides* waste contained considerably lower relative levels of PUFA. The degree of fatty acid unsaturation was not related to the geographic location of the species examined. (Auth.)

B-50432

Quartino, L., **Benthic algae of Potter Cove** [Algas marinas bentónicas de caleta Potter], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1994, No.419, Structure and dynamics of coastal ecosystems at Jubany Station. Data report, p.42-46, In Spanish. 9 refs.

During the summer of 1991-1992, samples of marine benthic algae were obtained in Potter Cove at 5, 10, 15 and 20 m depth following a line perpendicular to the coast. The frequency and biomass values per sq m of a total of 19 species determined, of which *Himantothallus grandifolius* and *Ascoseria mirabilis* were the dominant species, are shown in a table.

B-50433

Silva, M.P., **Ecology of the limpet *Nacella concinna* (Strebel, 1908) from the Potter Peninsula** [Ecología de la lapa *Nacella concinna* (Strebel, 1908) en península Potter, islas Shetland del Sur, Antártida], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1994, No.419, Structure and dynamics of coastal ecosystems at Jubany Station. Data report, p.47-50, In Spanish. 10 refs.

The size distribution and density of *Nacella concinna* were studied in 1074 specimens collected from various levels of the littoral zone of Potter Peninsula between Nov. 1992 and Jan. 1993. The limpet size averaged 26.03 mm, and the density averaged 31.85 limpets per sq.m. A decrease of shell size and increase of density were found to be related to increasing distance from the coast.

B-50434

Iken, K., **Herbivore-algal trophic relationships in shallow waters of Potter Cove** [Relaciones tróficas entre macroalgas y animales herbívoros en un sistema de aguas someras (caleta Potter, isla 25 de Mayo/King George Island)], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1994, No.419, Structure and dynamics of coastal ecosystems at Jubany Station. Data report, p.51-57, In Spanish. 29 refs.

Observations carried out on herbivores living in association with macroalgae in shallow waters of Potter Cove showed that the latter constitute an important food supplement to some gastropods, amphipods and fish, with the exception of *Himantothallus*, the only species not used as food by any of the animals studied. This is attributed to the presence of polyphenols, a chemical defense against its marine predators.

B-50435

Fernández Giuliano, S., et al, **Grazing strategies of the benthic amphipod *Pontogeneia antarctica*** [Estudios preliminares sobre estrategias de pastoreo del anfípodo bentónico *Pontogeneia antarctica* (Chevreux, 1906)], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1994, No.419, Structure and dynamics of coastal ecosystems at Jubany Station. Data report, p.60-65, In Spanish. 6 refs.

After determining the stomach contents of *Pontogeneia antarctica* from samples obtained during Feb., Mar., Nov. and Dec. of 1991, the grazing and ingestion rates of adult and juvenile individuals were measured by various methods described to establish any differences between them regarding quantity and selectivity of food ingested. Preliminary results are discussed and presented in a table.

B-50438

Wang, R., et al, **Population structure of the antarctic krill in the Prydz Bay region, Indian Ocean sector of the southern ocean**, *Antarctic research (Chinese edition)*, Dec. 1993, 5(4), p.1-11, In Chinese with English summary. 24 refs.

The results presented in this paper are based on net sampling carried out during 2 science cruises in 1989-1990 and 1990-1991 summers in the Prydz Bay region; the population structures of krill were studied. Length/frequency distribution shows that the krill population in this area mainly consists of 4 age groups: 1⁺, 2⁺, 3⁺ and 4⁺, excepting the larvae. Five⁺ and >5⁺ age groups account for a very small proportion of the population (less than 3%). Regional differences in population structure are evident. Samples collected from north Prydz Bay presented typical bimodal L/F distribution, with a strong 1⁺ age group. Catches from the east and west part of the research area presented a monomodal L/F distribution, with the subadults and adults as the bulk of the population. Annual variation in population structure during the two summers was evident, especially in the 1⁺ age group. (Auth. mod.)

B-50439

Wang, R., et al, **Sexual maturity stages and spawning of antarctic krill in the Prydz Bay region**, *Antarctic research (Chinese edition)*, Dec. 1993, 5(4), p.12-21, In Chinese with English summary. 29 refs.

This paper presents the results of net sampling carried out during 2 cruises in the summers of 1989-1990 and 1990-1991 in the Prydz Bay region; the sexual maturity stages of 8243 specimens of krill were examined. The spawning season begins in Jan. and extends to Mar. with maximum spawning occurring in mid- or late- Feb., about one month later than in the Atlantic sector. The L/F distribution of gravid females shows that the spawning population consists mainly of 2 age groups: 3⁺ and 4⁺. The 3⁺ adults are the main spawners. Two⁺ and 5⁺ are rarely seen in the spawning population, if at all. Among the 5916 specimens with sex determination, only 34% were males. The percentage of males decreases with increasing body size. It drops to 22.9% when the body length exceeds 50 mm. (Auth. mod.)

B-50440

Wang, R., Zhong, X.F., **Distribution and abundance of larvae of antarctic krill in the Prydz Bay region, Indian Ocean sector of the southern ocean**, *Antarctic research (Chinese edition)*, Dec. 1993, 5(4), p.22-31, In Chinese with English summary. 27 refs.

During the austral summers of 1989-1990 and 1990-1991, net sampling surveys were carried out on the distribution and abundance of krill larvae in the Prydz Bay region. In 1990, the average density of larvae in Jan. was 26 ind./1000 m³, increasing to 162 ind./1000 m³ in Feb. In 1991, it reached 20,113 ind./1000 m³ in Jan. and 60,048 ind./1000 m³ (surface sampling by high-speed plankton sampler) in Mar. The peak abundance of krill larvae seems to occur in Mar. Annual fluctuation in distribution and abundance of larvae was evident. In 1990 only 1/2 of the hauls were positive; most of the larvae were calyptopis I and II and no furciliars were found. Larvae were more abundant in 1991; about 2/3 of the hauls were positive and furcilia I-IV were widely distributed in the open area. This fluctuation can be attributed to the difference of water temperature. The surface temperature at the same latitude in Jan. was much higher (0.05-1.24 C) in 1991 than in 1990. The geographic distribution of the average development stages showed that older larvae occurred to the north and the younger to the south. (Auth. mod.)

B-50441

Zhong, X.F., Wang, R., **Distribution and larval development of *Euphausia crystallorophias* in the Prydz Bay region, Antarctica**, *Antarctic research (Chinese edition)*, Dec. 1993, 5(4), p.32-39, In Chinese with English summary. 12 refs.

During the austral summers of 1989-1990 and 1990-1991 a net sampling program was carried out in the Prydz Bay region, including zooplankton samples (by an 80 cm conical net) and krill samples (by a 6 feet IKMT). The distribution and abundance of larvae and adults of *Euphausia crystallorophias* were studied. Both the larvae and adults of this species occurred only in shelf waters and in the inner margin of slope waters (less than 1000 m in depth). Larval density ranged from 70 to 44,356 ind./1000 m³, with the highest density occurring inside Prydz Bay. The density of juveniles and adults ranged from 10 to 203 ind./1000 m³, with an average of 57 ind./1000 m³. In 1990, 6 larval stages (N1-C3) were found in Jan., with the MSI (mean stage index) ranging from 4.12 to 5.07. In Feb.-Mar. of the same year, they were replaced by C1-F3, with the MSI ranging from 6.98 to 7.81. The larval stage composition indicated that the breeding of

this species seemed to start in early Nov. and end in late Dec. The L/F distribution of juveniles and adults, as well as the length-weight relationships, are given. (Auth.)

B-50442

Zhong, X.F., Wang, R., **Distribution, abundance and reproductive ecology of *Thysanoessa macrura* (Crustacea: Euphausiacea) in the Prydz Bay region, Antarctica, *Antarctic research (Chinese edition)***, Dec. 1993, 5(4), p.40-49, In Chinese with English summary. 19 refs.

During the austral summers of 1989-1990 and 1990-1991, net sampling surveys were carried out on the distribution, abundance, age composition, development and reproductive ecology of *Thysanoessa macrura* G.O. Sars in the Prydz Bay region. Larvae occurred throughout the research areas with comparatively high abundance. The average density of larvae was 744 ind./1000 m³ in Jan. 1990, and 1155 ind./1000 m³ in Jan. 1991. They were more abundant in open ocean waters than in slope and shelf waters. In 1990, the larval developmental stages from C1 to F2 were found in early Jan., with the mean stage index (MSI) equal to 2.78. In late Feb. they were replaced by C2-F5 (MSI=4.89), and in early Mar. by C3-F6 (MSI=5.00). More advanced developmental larval stages were found in 1991, C1-F3 (MSI=3.75) in early Jan. and F1-F6 (MSI=8.70) in early Mar. Latitudinal differences in larval developmental stage composition or in MSI could be clearly found: the closer to the shelf, the younger the larvae. The mean developmental time from stage to stage by field data was 13-19 days in 1989-1990 and 11 days in 1990-1991. The main breeding season of *T. macrura* in Prydz Bay area seems to start in early Oct. and end in early Jan. Adults and juveniles were widely dispersed, but swarms were found mainly close to the Antarctic Divergence. Interannual variations in time of breeding, survival of larvae and abundance of adults were evident; more advanced larval stages, which means an earlier breeding season, shorter developmental time for larval stages, and more abundant adults and juveniles were observed in 1990-1991 than in the previous year. These could be attributed to warmer water temperature. (Auth.)

B-50444

Liu, Z.L., et al, **Size-fractionated biomass and productivity of phytoplankton and particulate organic carbon in the surface of the routine encircling the Antarctic, *Antarctic research (Chinese edition)***, Dec. 1993, 5(4), p.63-72, In Chinese with English summary. 28 refs.

During the austral summer of 1989-1990, cell sized-fractionated biomass and productivity of phytoplankton, particulate organic carbon (POC) and the relevant environmental parameters in the surface of a large scale sea area encircling the antarctic continent were observed. The results showed that in antarctic waters, the South Atlantic Ocean is the most fertile. Chlorophyll *a* concentration averaged over 2 microgram/dm³, and the average POC concentration was also the highest (>100 microgram/dm³) when compared to that of the Drake Passage and the Indian Ocean. The results of measuring size-fractionated chlorophyll *a* showed that netplankton with cell >20 microns in the South Atlantic Ocean accounted for the highest proportion (65%), while in the infertile Indian Ocean picoplankton accounted for the highest proportion (47%). The results of size-fractionated productivity showed that the contribution of picoplankton to total productivity was the largest in the South Atlantic Ocean and the Drake Passage. The relative high photosynthesis assimilation number of picoplankton indicates its importance in marine ecosystems of antarctic waters. In comparison with the antarctic waters, the subantarctic and subtropical waters are infertile. (Auth.)

B-50445

Zhu, G.H., Liu, Z.L., Ning, X.R., **Distribution characteristics of nano- and micro-phytoplankton in Prydz Bay and its adjacent South Indian Ocean, Antarctica, in summer, *Antarctic research (Chinese edition)***, Dec. 1993, 5(4), p.73-82, In Chinese with English summary. 7 refs.

Phytoplankton samples were collected from 34 stations in Prydz Bay and the adjacent Indian Ocean from Dec. 1990 to Jan. 1991. One hundred and twenty-two taxa, representing 5 phyla and 40 genera, were identified. Of these, 73% consisted of diatoms, 20.5% of dinoflagellates, and 6.5% of other species. The average cell abundance of nano- and micro-phytoplankton was 2551 x 10⁴ cells/m³ in surface waters. The highest con-

centration of nano- and micro-phytoplankton occurred in Prydz Bay and its adjacent continent at station IV 7, and the northern area between West Ice Shelf and Shackleton Ice Shelf. Minimal abundance occurred in the northwest area of Prydz Bay. The average cell abundance of nano- and micro-phytoplankton from net samples was 811 x 10⁴ cells/m³, of which the highest concentrations occurred in adjacent continental waters off Prydz Bay and the northern area of West Ice Shelf. Low abundances occurred in the eastern water area of Shackleton Ice Shelf. The nano- and micro-phytoplankton maximum was usually found in surface waters and above 50 m depth, and gradually decreased with depth from 100 to 200 m. (Auth. mod.)

B-50447

Guo, N.L., Chen, X.Z., Xu, Z.Y., Shi, C.J., **Distribution and preliminary observation of the biomass of antarctic krill in the Prydz Bay region by echogram analysis, *Antarctic research (Chinese edition)***, Dec. 1993, 5(4), p.90-103, In Chinese with English summary. 21 refs.

Open-ocean surveys, particularly of krill ecology, were carried out in the vicinity of Prydz Bay by two Chinese antarctic expeditions during the 1989-1990 and 1990-1991 seasons. A color fishfinder (Atlas 792 DS, made in Germany) was used in the search for krill during both expeditions. On the basis of images recorded by the fishfinder, and the results obtained from sampling stations, the concentration of krill outside of Prydz Bay was very low in the 1989-1990 season. In the second season, Dec. 27, 1990-Jan. 11, 1991, the horizontal distribution of krill in the surveyed waters was divided into three areas: 61-65S, 103-108E; 63.5-65.5S, 84- 86E; and 62-65S, 72-73E. Most of the aggregations occurred in depths of 30-60 m; the central area of concentration was located in the 40 m layer, within a 10 m range of fluctuation. Also, based on images recorded, 2.2 x 10⁸ tons of standing crops and 32.59 t/km² of density of distribution were hydroacoustically estimated using WT-2 type image processing system and special software. (Auth. mod.)

B-50458

Putt, M., Miceli, G., Stoecker, D.K., **Association of bacteria with *Phaeocystis* sp. in McMurdo Sound, Antarctica, *Marine ecology progress series***, Feb. 17, 1994, 105(1-2), p.179-189, Refs. p.187-189.

A microscopic study of bacteria and *Phaeocystis* sp. during the annual bloom in McMurdo Sound is presented. During the initial phases of the bloom when *Phaeocystis* sp. was actively growing, bacterial abundance and cell size both increased, suggesting that the bacterial community was also actively growing. At 5 and 25 m, the median density of bacteria associated with *Phaeocystis* sp. colonies ranged from about 2- to over 11-fold greater than over an equivalent area of a nearby region of the slide. On 7 of 8 sampling dates, the length of bacteria associated with *Phaeocystis* sp. colonies was similar to or larger than pelagic bacteria from the same sample, suggesting that bacterial growth rates were not reduced by their proximity to the alga. In short, rather than bacteriocidal effects sometimes ascribed to *Phaeocystis* sp., a close association between both pelagic and epiphytic bacteria and *Phaeocystis* sp. was observed throughout the bloom in McMurdo Sound. As the season progressed, disappearance of *Phaeocystis* sp. colonies in the upper water column corresponded to the appearance of a large bacterial bloom at and below 100 m depth. The authors speculate that in McMurdo Sound, the close alga-bacterial association might enhance remineralization of *Phaeocystis* sp. thus reducing the amount of organic material originating from the bloom which ultimately reaches the sediments. (Auth. mod.)

B-50459

Jouventin, P., Capdeville, D., Cuenot-Chaillet, F., Boiteau, C., **Exploitation of pelagic resources by a non-flying seabird: satellite tracking of the King Penguin throughout the breeding cycle, *Marine ecology progress series***, Mar. 17, 1994, 106(1-2), p.11-19, Refs. p.18-19.

Foraging ranges and strategies of King penguins at Crozet Is. were investigated for 19 mo, using satellite tracking for the first time on this species. Eighteen penguins were fitted with transmitters to determine foraging behavior throughout the breeding cycle in relation to oceanographic data. The mean foraging range was 471 +/- 299 km (range 144 to 1489). The total length of trips was 1239 +/- 671 km (range 397 to 3893), i.e. 64 +/-

- 31 km daily. There was a change in the length and direction of tracks according to the breeding phase of the penguin and probably also according to the position of the Polar Front which moves northwards during austral winter and autumn. All the locations of penguins were restricted to the zone of modified antarctic waters around the Crozet Is., where myctophids, the major prey of King penguins, are available between 200 m deep and the surface (5 C isotherm). Near the Antarctic Circumpolar Current where cold water masses flow, fewer King penguin locations were found than near the Polar Front, where the 5 C isotherm reaches the surface. It is suggested that the foraging ecology of the King penguin is closely related to oceanographic features and the biology of its main prey. (Auth. mod.)

B-50460

Hosie, G.W., Cochran, T.G., **Mesoscale distribution patterns of macrozooplankton communities in Prydz Bay, Antarctica—January to February 1991**, *Marine ecology progress series*, Mar. 17, 1994, 106(1-2), p.21-39, Refs. p.37-39.

Previous large-scale surveys have identified the continental shelf edge of Prydz Bay as an area of rapid transition among 3 major zooplankton communities. One of these communities is dominated by the krill located mainly along the continental shelf edge, usually between the offshore main oceanic community dominated by copepods and chaetognaths, and the neritic community dominated by *E. crystallorophias*. In Jan. to Mar. 1991, the Prydz Bay continental shelf area was the subject of a more intensive mesoscale survey. Cluster analysis and non-metric multidimensional scaling were used to define the communities, their distribution patterns, indicator species and species affinities. The compositions of the communities were much the same as previously defined. *E. superba* again exhibited a distinct dissociation from all other species. However, the distribution pattern of the krill-dominated community was different from those previously observed. That community did not separate the copepod- and *E. crystallorophias*-dominated communities in Prydz Bay and apparently was displaced to the west. Temperature was strongly correlated with the zooplankton community distribution patterns, suggesting that temperature has more influence at the mesoscale level than at larger scales. Sea ice patterns, chlorophyll *a* abundance and salinity were also correlated, to a lesser extent, with the community distribution patterns. (Auth.)

B-50461

Wilson, R.P., Culik, B.M., Bannasch, R., Lage, J., **Monitoring antarctic environmental variables using penguins**, *Marine ecology progress series*, Mar. 17, 1994, 106(1-2), p.199-202, 14 refs.

Water temperature and krill abundance in Maxwell Bay were examined using Pygoscelid penguins carrying appropriate sensors linked to position-determining devices. Fifty-three foraging trips from 49 penguins indicated that during Dec. 1991 and Jan. 1992 the temperature in the top 100 m of the water column was highest in the western section of the Bay which coincided with higher krill abundance as determined by a catch per unit effort index. This work demonstrates that abiotic and biotic features of the environment can be studied using animals to transport probes to the study site, provided information is given on the position of the animals when measurements are made. (Auth.)

B-50462

Chown, S.L., **Historical ecology of sub-Antarctic weevils (Coleoptera: Curculionidae): patterns and processes on isolated islands**, *Journal of natural history*, Mar.-Apr. 1994, 28(2), p.411-433, Refs. p.426-433.

The *Ectemnorhinus* group of weevils is endemic to the South Indian Ocean Province Is. of the subantarctic region. Although small (36 species), it is the most diverse monophyletic arthropod taxon in the province. As such it is one of the few groups which allows comparisons of ecological and evolutionary patterns displayed by biotas on the extremely isolated subantarctic archipelagos, with those exhibited by tropical or northern temperate biotas. Current information on habitat use, diet, assemblage structure and the evolution of the group is reviewed and compared with similar studies of tropical or temperate island biotas, as well as with current ideas on the ecology and evolution of island biotas. A recent phylogeny is used as a chronicle on which to base this historical account. The 36 species fall within six genera which have two major lifestyles, viz. angiosperm herbivory or cryptogam herbivory. These feeding habits con-

strain species in their habitat distributions on the islands and seem to have been a result of climatic forcing associated with Milankovitch cycles, rather than taxon cycles or pulses associated with competition in a center of origin. (Auth. mod.)

B-50463

Bartsch, I., Pugh, P.J.A., **Two new species of *Halacarellus* (Halacaridae: Acari) from South Georgia**, *Journal of natural history*, Mar.-Apr. 1994, 28(2), p.493-499, 10 refs.

Two new mite species, *Halacarellus porellus* n.sp. and *H. novellus* n.sp., are described. Both species were collected from the littoral zone in a sheltered bay on the northeast coast of South Georgia in the South Atlantic. (Auth.)

B-50466

Green, K., Mound, L.A., **Extension to the insect fauna of Heard Island**, *Polar record*, Apr. 1994, 30(173), p.131-132, 14 refs.

The insect fauna of Heard I. were investigated on the *Challenger* Expedition in 1875; the Deutsche Sudpolar-Expedition in 1902; and the Australian National Antarctic Research Expedition in 1951-52. With the addition of Lepidoptera in these last reports, six orders of insects were recognized as occurring on Heard I., the others being Collembola, Coleoptera, Diptera, Siphonaptera, and Mallophaga. The present note reports the addition of a seventh order, Thysanoptera, to the fauna.

B-50473

Clarke, A., Prothero-Thomas, E., Whitehouse, M.J., **Nitrogen excretion in the antarctic limpet *Nacella concinna* (Strebel, 1908)**, *Journal of molluscan studies*, May 1994, 60(2), p.141-147, 25 refs.

Excretion of ammonia, urea and primary amines (assayed as fluorescent-positive substances, FPS) was measured in the antarctic limpet *Nacella concinna*. The mean contributions to overall excretion rate were 89% ammonia, 8% urea and 3% FPS, although in some individuals urea formed almost 40% total excreted nitrogen and in others primary amines formed over 30%. Ammonia and urea excretion rates were not correlated, suggesting that ureagenesis has a specific physiological role and is not simply an alternative end-point to ammonia. In starved limpets urea excretion at first increased by at least x2, and then declined to low levels after 44 days. Ammonia excretion also increased, but only after 20 days, and then stayed high until at least day 44. These different patterns confirm the independent roles of ammonia and urea production in *Nacella*. (Auth.)

B-50474

Scientific Committee for the Conservation of Antarctic Marine Living Resources, **Report of the twelfth meeting of the Scientific Committee, Hobart, Australia, 25-29 October, 1993**, Hobart, Tasmania, CCAMLR, 1993, 431p., Refs. passim.

This document presents the adopted record of the 12th meeting of the Scientific Committee for the Conservation of Antarctic Marine Living Resources held in Hobart, Australia, from Oct. 25-29, 1993. Major topics discussed at this meeting include: krill, fish, crab and squid resources, ecosystem monitoring and management, marine mammal and bird populations, assessment of incidental mortality, United Nations Conference on straddling stocks and highly migratory species, and publication of scientific papers. Reports of meetings and intersessional activities of subsidiary bodies of the Scientific Committee, including the Working Groups on Krill, on Fish Stock Assessment and for the CCAMLR Ecosystem Monitoring Program, are appended. (Auth.)

B-50475

Commission for the Conservation of Antarctic Marine Living Resources, **Report of the twelfth meeting of the Commission, Hobart, Australia, 25 October-5 November, 1993**, Hobart, Tasmania, CCAMLR, 1993, 133p.

This document presents the adopted record of the 12th meeting of the Commission for the Conservation of Antarctic Marine Living Resources held in Hobart, Australia from Oct. 25 to Nov. 5, 1993. Major topics discussed at this meeting included: review of the Report of the Scientific Committee, assessment and avoidance of incidental mortality of antarctic marine living resources, current operation of the Systems of Inspection

and Scientific Observation, compliance with conservation measures in force, review of existing conservation measures and adoption of new conservation measures including catch limits for a number of species of finfish and for antarctic crabs, and cooperation with other international organizations including the Antarctic Treaty System. The Reports of the Standing Committee on Administration and Finance and the Standing Committee on Observation and Inspection are appended. (Auth.)

B-50476

Bost, C.A., et al, **Gentoo penguin *Pygoscelis papua* diet as an indicator of planktonic availability in the Kerguelen Islands**, *Polar biology*, Apr. 1994, 14(3), p.147-153, Refs. p.152-153.

During winter and spring of 1987 and 1989, the authors investigated the composition of the diet of gentoo penguins, in relation to changes in the availability of two prey species, *Euphausia vallentini* and *Themisto gaudichaudii*, sampled during plankton surveys at the Kerguelen Is. The comparison between plankton surveys and diet analysis was performed on samples taken 2-4 km from the studied colonies. Data on the abundance of zooplankton derived from penguins' diet matched closely those from net hauls during a year of high plankton availability (1987). On the other hand, a weaker correspondence was found during a year of restricted availability (1989). The mean sizes of amphipods caught by penguins and net hauls were very similar but the size distribution showed comparatively fewer small and large individuals in net-hauls than in penguin stomachs. (Auth. mod.)

B-50477

Brêthes, J.C., Ferreyra, G., De la Vega, S., **Distribution, growth and reproduction of the limpet *Nacella (Patinigera) concinna* (Strebel 1908) in relation to potential food availability, in Esperanza Bay (Antarctic Peninsula)**, *Polar biology*, Apr. 1994, 14(3), p.161-170, Refs. p.169-170.

The effects of environmental factors (water temperature, food availability) on the patellid limpet *Nacella (Patinigera) concinna* in Hope Bay are reported. Sampling was conducted at three depths (intertidal, 5 m, 10 m) from Feb. 1987 to Jan. 1988. Temperature was recorded and concentrations of chlorophyll *a* were measured on the bottom, in the water and in the ice-water layer. The limpets were measured, weighed and a condition coefficient for somatic and gonadal mass was calculated. Their ages were estimated through size frequency distribution analysis and a seasonalized von Bertalanffy growth model was applied. The intertidal subpopulation migrated to deeper levels at the beginning of the icing season and recolonized the intertidal zone after ice retreat. Growth rates were very low, and showed important seasonal variations, with maxima during Dec. and Jan. *N. (P.) concinna* spawns once a year and spawning coincides with raising water temperature (from -1.33 to -0.84 C). (Auth. mod.)

B-50478

Donnelly, J., Torres, J.J., Hopkins, T.L., Lancraft, T.M., **Chemical composition of antarctic zooplankton during austral fall and winter**, *Polar biology*, Apr. 1994, 14(3), p.171-183, Refs. p.182-183.

Water level, ash content, proximate (protein, lipid, carbohydrate and chitin) and elemental (carbon and nitrogen) composition were analyzed in 23 species of zooplankton collected during the fall (1986) and winter (1988) from the Scotia/Weddell Sea region. Extremes in water level, ash content and organic components were typified by copepods and gelatinous forms. Ostracods and polychaetes were generally similar in composition to copepods, being only slightly higher in water level and ash content. Chaetognaths exhibited a composition intermediate in character with some components similar in value to those shown by crustaceans (i.e. protein), while other components were more in the range of values seen in gelatinous forms (i.e. water level and ash content). Seasonal comparisons were possible for 12 of the 23 species. Among crustaceans, changes in water level and organic components were variable, reflecting dissimilar trophic, reproductive or ecological habits among different species. Essentially no change in composition between fall and winter was observed for diapause species (e.g. *Calanoides acutus* and *Rhincalanus gigas*) as well as for omnivorous/carnivorous species (e.g. *Gaetanus tenuispinus*). Conversely, large compositional changes were evident for *Calanus propinquus*, a small-particle grazer that relies heavily on lipid reserves.

Chaetognaths and some gelatinous species exhibited a considerable decrease in ash content from fall to winter, which in most cases was mirrored by some degree of increase in lipid level. (Auth. mod.)

B-50479

Tupas, L.M., Koike, I., Karl, D.M., Holm-Hansen, O., **Nitrogen metabolism by heterotrophic bacterial assemblages in antarctic coastal waters**, *Polar biology*, Apr. 1994, 14(3), p.195-204, Refs. p.203-204.

Field studies to examine the *in situ* assimilation and production of ammonium (NH_4^+) by bacterial assemblages were conducted in the northern Gerlache Strait region. Short term incubations of surface waters containing $^{15}\text{N-NH}_4^+$ as a tracer showed the bacterial population taking up 8-25% of total NH_4^+ uptake rates. The large bacterial uptake of NH_4^+ occurred even at low bacterial abundance during a rich phytoplankton bloom. After converting bacterial carbon production to an estimate of nitrogen demand, NH_4^+ was found to supply 35-60% of bacterial nitrogen requirements. Bacterial nitrogen demand was also supported by dissolved organic nitrogen, generally in the form of amino acids. It was estimated, however, that 20-50% of the total amino acids taken up were mineralized to NH_4^+ . Bacterial production of NH_4^+ was occurring simultaneously with its uptake and contributed 27-55% of total regenerated NH_4^+ in surface waters. By using a variety of ^{15}N -labelled amino acids, the authors found that the bacteria metabolized each amino acid differently. With their large mineralization of amino acids and their relatively low sinking rates, bacteria appear to be responsible for a large portion of organic matter recycling in the upper surface waters of the coastal antarctic ecosystem. (Auth. mod.)

B-50480

Culik, B., **Energetic costs of raising Pygoscelid penguin chicks**, *Polar biology*, Apr. 1994, 14(3), p.205-210, 19 refs.

Energy requirements of resting Adélie, Gentoo and Chinstrap penguin chicks were determined with respect to body mass via respirometry in Antarctica. Resting metabolic rates of all pygoscelid penguin chicks were similar (ANOVA $p=0.91$). Using the results obtained and data published in the literature, the author determined the amount of food needed from hatching to fledging as 29.8, 31.7 and 56.4 kg per chick for Adélie, Chinstrap and Gentoo penguins, respectively; and the average amount of food left daily to the parent after feeding the brood throughout the breeding period. Parents keep only a minimum of food for themselves just prior to the time when chicks begin forming crèches. Thereafter, nest relief intervals are increased, and the amount of food parents can keep for themselves rises. The results of both models are discussed with respect to available data on pygoscelid penguin food requirements. (Auth. mod.)

B-50481

Chastel, O., **Maximum diving depths of common diving petrels *Pelecanoides urinatrix* at Kerguelen Islands**, *Polar biology*, Apr. 1994, 14(3), p.211-213, 26 refs.

This paper reports on the first study on maximum dive depth attained by male and female common diving petrels (*Pelecanoides urinatrix*) fitted with maximum dive depth gauges during various stages of the breeding cycle. The study was carried out on Mayes I., in the Morbihan Gulf of Kerguelen Is. between Dec. 17, 1991, and Feb. 15, 1992. During the course of the study, 103 maximum dive depths were successfully recorded. The mean maximum dive was 38.96 +/- 7.35 m. The deepest dive was 63.58 m and the shallowest 14.73 m. (Auth. mod.)

B-50482

Ulbricht, J., Zippel, D., **Delayed laying and prolonged fasting in Adélie Penguins *Pygoscelis adeliae***, *Polar biology*, Apr. 1994, 14(3), p.215-217, 11 refs.

Observations of nesting Adélie penguins were made at Ardley I. during spring 1990 when snow cover was unusually deep at some subcolony sites. Adélie penguins at these sites had to delay egg laying until the snow melted. Maximum length of fasting periods comprising pre-breeding and incubation was 50 days. Long fasting seemed to have no detrimental effect on breeding. Furthermore, there was no relationship between penguin arrival mass and duration of fast. Even birds with small mass had sufficient reserves to endure long fasting periods. (Auth.)

B-50508

Van Franeker, J.A., Ter Braak, C.J.F., **Generalized discriminant for sexing fulmarine petrels from external measurements**, *Auk*, July 1993, 110(3), p.492-502, Refs. p.501-502.

Discriminant analysis can use morphometric differences between known male and female birds to predict the sex of unknown individuals in field studies. Geographic variation in size and shape often limits the predictive value of a discriminant function to the population from which it was derived. Specific discriminant functions for populations of five species of fulmarine petrels (Northern Fulmar, *Fulmarus glacialis*; Southern Fulmar, *F. glacialisoides*; Antarctic Petrel, *Thalassoica antarctica*; Cape Petrel, *Daption capense*; and Snow Petrel, *Pagodroma nivea*) assigned 81 to 98% of birds in the samples to the correct sex, but the validity of each discriminant applied to alternative populations remained questionable. The authors' approach to overcome this limitation is to combine data from the different species into a single discriminant. Adequate performance of this generalized discriminant in samples of different species shows its validity for use in other populations of any of these species. Depending on species, the generalized method results in 84 to 97% correct classifications and can be applied to other populations of fulmarine petrels without requiring samples of birds of known sex. (Auth. mod.)

B-50509

Huntley, M.E., Nordhausen, W., Lopez, M.D.G., **Elemental composition, metabolic activity and growth of antarctic krill *Euphausia superba* during winter**, *Marine ecology progress series*, Apr. 21, 1994, 107(1-2), p.23-40, Refs. p.38-40.

Euphausia superba Dana was collected at stations encompassing 3 deg of latitude in ice-covered waters west of the Antarctic Peninsula in the winter of 1992 (July-Aug.), and in the same region the previous summer (Dec.-Jan.). There was no significant change in any biometric index (dry weight vs length, carbon vs dry weight, nitrogen vs dry weight, or body C:N). Rates of ammonium excretion in winter were not significantly different from those previously reported for *E. superba* in summer. It was clear that *E. superba* fed as a carnivore in winter. Copepod body parts consistently occurred in krill guts. During winter shipboard experiments, freshly caught krill ingested copepods and produced faeces at rates comparable to those measured in summer. The low ratio of N:P excretion (2.02) also suggests carnivorous feeding. A physiological model of carbon and nitrogen metabolism indicates that *E. superba* must feed during winter to maintain its observed C:N ratio and rate of ammonium excretion. On a diet of less than 1 *Metridia gerlachei* female copepod per day, a 20 mm krill can grow with a growth efficiency comparable to that achieved in summer. (Auth. mod.)

B-50511

Ainley, D.G., Ribic, C.A., Fraser, W.R., **Ecological structure among migrant and resident seabirds of the Scotia-Weddell Confluence region**, *Journal of animal ecology*, Apr. 1994, 63(2), p.347-364, Refs. p.360-361.

The authors quantitatively assess seasonal changes in community structure and habitat selection among seabirds in the Scotia-Weddell Confluence region during spring 1983, autumn 1986 and winter 1988. For the first time for the southern ocean, seasonal changes are described in seabird communities in terms of composition, using cluster analysis as well as relative density and diversity among species. Sea-surface temperature, distance to the pack ice edge and ice type, all physical characteristics of habitat, were the most important environmental variables that affected assemblage composition. Three recurrent assemblages of species are identified. One persistent assemblage, present year round, was associated with the pack ice; another was associated with open waters immediately adjacent to the ice; and a third was a far-from-ice assemblage. Only the two open-water assemblages changed markedly on a seasonal basis. In spite of a major reduction in the number and density of species in the open-water assemblages during winter, the pack-ice assemblage exhibited no habitat expansion, which might be expected if competition affected community structure and habitat selection. (Auth. mod.)

B-50512

Pakhomov, E.A., **Feeding habits and estimate of ration of Gray Notothenia, *Notothenia squamifrons squamifrons*, on the Ob and Lena tablemounts (Indian Ocean sector of Antarctica)**, *Journal of ichthyology*, 1993 (Pub. Mar.94), 33(9), p.57-71, Translated from Voprosy ikhtiologii 33(3):407-416, 1993. Refs. p.70-71.

Using long-term (1970-1989) data from the Ob and Lena tablemounts, the feeding habits of *Notothenia squamifrons squamifrons* were studied and its ration estimated. On the Ob Tablemount in summer, it feeds primarily on salps, ctenophores, and medusae, and in winter it feeds on micronektonic fishes. On the Lena Tablemount, its year round diet consists primarily of gelatinous organisms. With increased age (length) and depth of occurrence, planktonic organisms in the diet are replaced by micronektonic fishes. Mean daily ration, estimated by two methods, is 3.39-3.85% of body weight; the annual ration amounts to 11-14 times body weight. Mean daily consumption of the *N. s. squamifrons* population on the Ob and Lena tablemounts is 900 tons, annual consumption is 410 thousand tons or around 144×10^9 kcal. The food requirements of *N. s. squamifrons* on the Ob and Lena tablemounts evidently are completely provided for year round. (Auth.)

B-50522

Gutt, J., Siegel, V., **Benthopelagic aggregations of krill (*Euphausia superba*) on the deeper shelf of the Weddell Sea (Antarctic)**, *Deep-sea research*, Jan. 1994, 41(1), p.169-178, Refs. p.176-178.

Benthopelagic krill aggregations were found at the shelf edge in the southeastern Weddell Sea and observed directly along transects using a video camera mounted on a remotely operated vehicle. The observations were made at depths of 480 and 416 m from a distance of up to 200 cm above the bottom. At one station a swarm was observed to reach densities of several tens to several hundreds of specimens per m^3 ; maximum density exceeded 230 specimens per m^3 . At a second station only scattered krill were encountered. (Auth.)

B-50523

Pandey, K.D., Kashyap, A.K., Gupta, R.K., **Nitrogen fixation by cyanobacteria associated with moss communities in Schirmacher Oasis, Antarctica**, *Israel journal of botany*, 1992, 41(4-6), p.187-198, Refs. p.197-198.

N_2 fixation by cyanobacteria growing in association with moss communities in Schirmacher Ponds was investigated. Moss samples were collected from 4 sites differing in moisture regime: close to a lake (A), near a meltwater stream (B), a hilltop (C), and a nunatak (D). Cyanobacteria species diversity and density were variable in these sites. The maximum number of species were observed at site B, the minimum at site D. Jaccard coefficient analysis showed that none of the sites exhibited more than 55% similarity. Acetylene reduction was highest in samples at site D, where the relative proportion of N_2 fixing species was highest, and lowest at site B, which exhibited the lowest proportion of N_2 fixing species. The observed acetylene reduction was not due to heterotrophic N_2 fixing microbes. Results suggest that N_2 fixation is primarily performed by diazotrophic cyanobacteria, and rates are variable depending upon cyanobacteria species diversity and density. Soil properties below the moss community were modified in comparison to soil where cyanobacteria growth was absent. (Auth.)

B-50525

Davail, S., Feller, G., Narinx, E., Gerday, C., **Sequence of the subtilisin-encoding gene from an antarctic psychrotroph *Bacillus* TA41**, *Gene*, 1992, 119(1), p.143-144, 7 refs.

The nucleotide sequence of the subtilisin-encoding gene from the antarctic psychrotroph *Bacillus* TA41 was determined. The primary structure of the subtilisin precursor corresponds to a preproenzyme of 419 amino acids. Asp¹⁴⁴, His¹⁸¹ and Ser³⁵⁹ are the proposed catalytic residues of the protease active site. (Auth.)

B-50527

Chapuis, J.L., Chantal, J., Bijlenga, G., **Myxomatose without vectors on the subantarctic islands of Kerguelen three decades after its introduction** [La myxomatose dans les îles subantarctiques de Kerguelen, en l'absence de vecteurs, trente années après son introduction], *Académie des sciences, Paris. Comptes rendus. Serie III*, Feb. 1994, 317(2), p.174-182, In French with an

abridged English version and summary. 25 refs.

Myxoma virus was introduced into the Kerguelen archipelago in 1955-1956. Thirty years after its introduction, the virus is present in most areas inhabited by rabbits. Rabbit fleas and mosquitoes are absent from this group of islands and the disease is transmitted by contact. The timing of the beginning of new myxomatosis outbreaks, the absence of real epizootics as well as the higher percentage of infected males over females are specific observations in favor of this mode of transmission. The majority of 34 isolates tested between 1984 and 1988 are of intermediate virulence (Grades IIIA-IIIB). In these conditions, the impact of myxomatosis virus on rabbit populations estimated on two sites is low. Myxomatosis therefore plays only a minor role in the regulation of rabbit populations. (Auth.)

B-50528

Melick, D.R., Seppelt, R.D., **Seasonal investigations of soluble carbohydrates and pigment levels in antarctic bryophytes and lichens**, *Bryologist*, Spring 1994, 97(1), p.13-19, 24 refs.

Levels of soluble carbohydrates, moisture, and pigments in the major bryophytes and lichens from the Windmill Is. were monitored over a 14-month period. Gas-liquid chromatography revealed little seasonal change in soluble carbohydrate levels. Water content of vegetation varied throughout the season with maximum hydration occurring over the summer months. Pigment levels also varied seasonally with a decrease in total chlorophyll and chlorophyll *a/b* ratios during winter. Levels of total carotenoids increased over summer in response to high ambient irradiation. In contrast with the seasonality of soluble carbohydrates reported in some cryptogams from subpolar regions, the lack of any significant seasonal changes in the antarctic bryophytes and lichens may be due to the extreme climate and rapid temperature fluctuations in the continental antarctic environment. (Auth.)

B-50529

Baumann, M.E.M., Brandini, F.P., Staubes, R., **Influence of light and temperature on carbon-specific DMS release by cultures of *Phaeocystis antarctica* and three antarctic diatoms**, *Marine chemistry*, Jan. 1994, 45(1/2), p.129-136, 32 refs.

The net carbon specific release of dimethylsulfide (DMS) over 72 h by four phytoplankton species (*Nitzschia curta*, *Thalassiosira tumida*, *Chaetoceros socialis*, and *Phaeocystis antarctica*) at two temperatures (1 and -1.6°C), in response to a range of six irradiances was investigated in cultures isolated from the Weddell Sea. Under all conditions both mucoid species, *P. antarctica* and *C. socialis*, produced more DMS than the other two diatoms. DMS release was higher at low light conditions for *P. antarctica* and *C. socialis* and at high light conditions for *T. tumida* and *N. curta*. All species released more DMS at low temperatures. The results demonstrated a temperature dependency of DMS emissions by phytoplankton and corroborate early statements that production of DMS is related to physiological stress. (Auth.)

B-50544

Albertelli, G., ed, Ambrosetti, W., ed, Piccazzo, M., ed, Ruffoni Riva, T., ed, **Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990** [Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990], Genova, Consiglio Nazionale delle Ricerche, 1992, 776p., In Italian with English summaries. Refs. passim. For selected papers see B-50545 through B-50547, B-50550, B-50552 through B-50560, E-50548, E-50549, J-50551 and J-50561.

This is a collection of papers presented at the 9th Congress of the Italian Association of Oceanography and Limnology, held in S. Margherita Ligure, Italy, Nov. 20-23, 1990. Seventeen are pertinent to Antarctica and they report results from biological, ecological and geological oceanographic investigations carried out for the most part at Terra Nova Bay and in the Ross Sea.

B-50545

Arnaud, P.M., **Acclimatization of antarctic benthic invertebrates** [Attitudine ed adattamento degli invertebrati bentonici antartici], Atti del IX Congresso Nazionale della Associazione

Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.3-8, In Italian with English summary. 8 refs.

An analysis of the principal "aptitude criteria" required for the colonization of the antarctic benthic environment and adaptation to it is proposed. The benthic invertebrates are more exposed to the environmental consequences of low temperatures than to these temperatures themselves: ice, effects on hydrological and substrate conditions, and seasonality. The trophic, reproductive and ethological effects of the different kinds of ice, of the relatively weak abiotic barriers and of the seasonally contrasting food input are discussed. The intrinsic effects of low temperatures are more briefly treated. It is shown that the present composition and characteristics of the antarctic benthic invertebrate fauna are resulting more from a natural selection of species able to fit the environmental conditions than from an arising of new biological strategies fitting the natural constraints. (Auth.)

B-50546

Faranda, F., **Second antarctic campaign for biological, chemical and physical oceanography** [La seconda campagna antartica per l'oceanografia biologica, chimica e fisica], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.555-558, In Italian.

An account is given of the activities of the Italian scientists and organizations involved in the first 5-year plan of the Italian antarctic research program, which is coming to its conclusion, with a few words on the prospects of a second phase to follow.

B-50547

Battaglia, B., Bisol, P.M., **Biological research in Antarctica** [La ricerca biologica in Antartide], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.559-564, In Italian with English summary. 2 refs.

This paper summarizes the contributions of Italian biologists to the National Program for Antarctic Research. The investigations started with the establishment of Terra Nova Bay Station in the summer of 1985. The investigations are carried out in antarctic and subantarctic regions, and in several laboratories of Italian universities and of the National Research Council (CNR). The main purposes of these research activities are: the description of type and structure of living communities, adaptive mechanisms, and the evolutionary processes in the antarctic ecosystem. The research areas are as follows: flora, fauna and biogeography; evolutionary biology; mechanisms of physiological, biochemical and molecular adaptation; and ecology and ethology. Highlights of the results achieved and perspectives of the scientific program to be conducted in the future are briefly outlined. (Auth.)

B-50550

Triulzi, C., Nonnis Marzano, F., Mori, A., **Radioecology of Terra Nova Bay** [Aspetti radioecologici della Baia di Terra Nova in Antartide], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited

by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.583-592, In Italian with English summary. 12 refs.

Results of analyses of natural and artificial radioactivity contained in samples from Terra Nova Bay marine ecosystems, collected during the 1987-88 and 1988-89 campaigns, are presented. Data were obtained from sea water, sediments and marine organisms sampled in different stations of the area. Some results concerning terrestrial matrixes collected around the Italian station are also reported. Data values, with special consideration to the radioactive isotopes of cesium, are compared to results obtained from similar matrixes collected in the Northern Hemisphere before and after the Chernobyl nuclear plant accident. (Auth.)

B-50552

Innamorati, M., et al, **Spatial and temporal distributions of phytoplankton size fractions in antarctic waters: biomass and production, summer 1989/90**, Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.605-612, 8 refs.

Values for phytoplankton biomass and production in Terra Nova Bay during summer 1989-90 are found to be generally higher than those reported in literature for the Ross Sea; the observations made between the Antarctic Convergence and Terra Nova Bay show a much more heterogeneous situation and, in this case, also very high values (max. 305 mg/sq m, between 0 and 100 m depth, and variations between 250 and 10 mg/sq m in the Ross Sea).

B-50553

Naldi, M., et al, **Planktonic ostracod distribution in Terra Nova Bay** [Distribuzione degli Ostracodi planctonici nell Baia di Terra Nova], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.613-622, In Italian with English summary. 10 refs.

Results of a study on planktonic ostracods collected in Terra Nova Bay during the Italian oceanographic expedition of 1987-88 are reported. A total of 311 zooplankton samples were taken from 33 stations (a number of samples were collected from different layers at each station). Ostracods were found in 263 samples: 54,224 specimens were sorted and examined. Taxonomic identification at the species level was made for adult individuals only. Four species were identified: *Alacia belgicae*, *Metaconchoecia isocheira*, *Alacia hettacra* and *Metaconchoecia skogsbergi*. Some juvenile stages were tentatively ascribed to *Paraconchoecia* cf. *brachyaskos*. In almost all stations the dominant species is *A. belgicae*, which seems to be a true antarctic endemic species; two distinct forms of this population seem present as supported by the bimodal frequency distribution of carapace length measured on more than 2,000 adult specimens. A positive significant correlation was found between ostracod density and sampling layer depth. At most stations, total taxocoenosis density was higher at intermediate or deep layers, where ostracods make up the dominant zooplankton component. The vertical distribution pattern appears to be closely related to the detritivorous and carnivorous role of ostracods in the plankton food chain. (Auth.)

B-50554

Carli, A., Feletti, M., Mariottini, G.L., Pane, L., ***Metridia gerlachei* Giesbrecht distribution in Terra Nova Bay** [Distribuzione di *Metridia gerlachei* Giesbrecht, 1902 (Copepoda, Calanoida) nella Baia di Terra Nova (Mare di Ross)], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre,

1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.623-633, In Italian with English summary. 18 refs.

Zooplankton samples collected in Jan.-Feb. 1988 in the Ross Sea from 16 stations (12 located in Terra Nova Bay and 4 farther offshore) were examined to study the vertical distribution of the calanoid copepod *Metridia gerlachei* Giesbrecht, 1902. A total of 137 samples were analyzed. *M. gerlachei* was found at every sampling layer; different preferential layers were evidenced for adults and copepodids. Based on a careful biometric analysis of a large number of specimens, the assumption is made that a second generation of *M. gerlachei* appears toward the end of each antarctic summer. (Auth. mod.)

B-50555

Di Geronimo, I., et al, **Coastal benthic communities distribution in Terra Nova Bay** [Prime osservazioni sulle comunità bentoniche costiere di Baia Terra Nova (Mare di Ross, Antartide): bionomia e distribuzione], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.635-646, In Italian with English summary. Refs. p.644-646.

A preliminary analysis of the composition and distribution of hard and soft-bottom benthic assemblages in Terra Nova Bay was conducted on samples collected during the first and second Italian oceanographic cruises in Antarctica (1987-88, 1989-90). For both hard and soft substrate a clear zonation according to depth has been observed on the basis of the identification of "guide" species. The hard-bottom species are represented by micro- and macroalgae which form distinct facies (diatoms, soft Rhodophyta and encrusting Corallinacea). The soft-bottom assemblages are represented by single species (*Adamussium colbecki*) as well as by groups of species (sponges and cnidarians, bryozoans and polychaetes). The continental and marine ice seems to play a significant role in the distributional pattern observed, as well as the geomorphology and the sedimentary characteristics of the sea bottoms which, interacting with the current patterns of the Bay, create a large-scale mosaic of environmental situations. A comparison of these findings with other areas of the Ross Sea and of the Antarctic is discussed. (Auth. mod.)

B-50556

Gambi, M.C., et al, **Quantitative and functional aspects of coastal benthic communities of Terra Nova Bay** [Prime osservazioni sulle comunità bentoniche costiere di Baia Terra Nova (Mare di Ross, Antartide): aspetti quantitativi e funzionali], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.647-658, In Italian with English summary. Refs. p.656-658.

A preliminary analysis of some structural and functional parameters of shallow hard-bottom communities of Terra Nova Bay is given. Macroalgal biomass, zoobenthos density, community structure and feeding guilds distribution have been investigated in 5 stations placed along a rocky cliff at 0.5 m, 2 m, 6 m, 12 m and 16 m. The highest biomass is found in two macroalgal species, *Iridaea cordata* and *Phyllophora antarctica*, the latter replacing the former along the depth transect. The animal populations were represented by few taxa, often very abundant. A sharp zonation along depth was observed for the whole community as well as for individual taxons. The most abundant of the 29 collected taxa were the amphipod *Paramoera walkeri* (Stebbing) and the gastropod *Laevitorina antarctica* (Smith). (Auth. mod.)

B-50557

Vacchi, M., La Mesa, M., Tarulli, E., **Investigation by fixed gears on ichthyofauna of Terra Nova Bay (Ross Sea, Antarctica)**, Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.659-664, 8 refs.

During the 1987-88 austral summer an investigation was carried out on the ichthyofauna of the coastal waters of Terra Nova Bay. The samples were collected by bottom long-lines, trammel and gill nets as well as traps. All gears were worked during the maximum day-light hours. A total of 11 species were sampled; 2 other species were caught by other sampling systems. In agreement with the data known from other coastal areas of East Antarctica, *Pagothenia bernacchii* ranged first in terms of abundance (66% and 71%, respectively, of the total weight and total number of fish sampled) followed far behind by *Chionodraco hamatus*. By means of a statistical analysis, the relationship between the species and some sampling variables was studied. (Auth.)

B-50558

Hecq, J.H., et al, **Distribution of planktonic components related to structure of water masses in the Ross Sea during the Vth Italian antartide expedition**, Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.665-678, 25 refs.

An interdisciplinary study of the antarctic pelagic ecosystems, related to hydrodynamical constraints, has been realized during the 5th Italian oceanographic expedition on board the R/V *Cariboo* in the Ross Sea and the South Pacific Ocean during the summer 1989-90. Different analyses have confirmed the idea that the maximum of planktonic concentrations and productivity are linked to main frontal systems and, in the Antarctic Surface Water, with the areas of increased stability rather than nutrient availability. The results also confirmed that planktonic ecosystems depend essentially on the ice-retreat system. The stabilization of the upper layers of the water column due to the retreat of the constantly melting ice-edge may induce successive phytoplanktonic and zooplanktonic blooms. (Auth. mod.)

B-50559

Bruni, V., et al, **Water contamination indices at Terra Nova Bay Station** [Indicatori di contaminazione fecale nelle acque effluenti dal depuratore della Base Italiana in Antartide (1989/90)], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.679-688, In Italian with English summary. 7 refs.

Results are reported of colimetric investigations at Terra Nova Bay Station. The waters analyzed were: effluent water from the sewage disposal plant; water used for human consumption; and sea water from the Bay facing the station. The investigations were carried out to verify the efficacy of the sewage treatment plant in relation to the anthropic charge and its effect on the autochthonous marine microbial community in the Bay. The results obtained show: an over-loaded sewage treatment plant; pollution of seawater at the point where the effluent water from the plant mixes with it; and the potability of drinking water. The microbial autochthonous population does not show variations in relation to the allochthonous population. (Auth. mod.)

B-50560

Bianchi, F., Cioce, F., Socal, G., **Biology of the Weddell/Scotia Confluence and of the ice edge** [Note sull'oceanografia biologica della confluenza Weddell/Scotia e del ghiaccio marginale (EPOS Leg 1)], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.689-695, In Italian with English summary. 13 refs.

An oceanographic study (E.P.O.S.) from open ocean through the ice edge and under the pack ice of the Weddell Sea was conducted on the R/V *Polarstern* during the austral spring of 1988. The aim was to study the nutrient distribution as well as the phytoplankton associations. Four North-South transects were performed from Oct. 11 to Nov. 19: first transect revealed a late winter situation, with nutrients maxima (32, 98 and 2.2 microM respectively for nitrate, silicate and phosphate) and chlorophyll *a* minima below 1 microg/dm³. Phytoplankton production under the ice was very low, with abundances of 1-2 10⁴ cells/dm³ and a large number of empty frustules of pennate diatoms and detritus. In the last transect, ice melting led to some stratification on the water column, favoring phytoplankton growth and nutrient consumption (minima of 18, 30 and 1.5 microM of nitrate, silicate and phosphate). Phytoplankton bloom was found in the open ocean (Weddell-Scotia Confluence) and in the outer marginal ice zone, with chlorophyll maxima up to 3 microg/dm³ and centric diatom communities in long chains. (Auth.)

B-50562

Boletzky, S.V., **Embryonic development of cephalopods at low temperature**, *Antarctic science. Special issue*, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.139-142, 31 refs.

No information is available on the embryonic development of southern ocean cephalopods. Estimations of developmental times can only be made by extrapolation using data from other geographical areas. Based on known relationships between environmental temperature and embryonic development time, it appears that below 5 C even the smallest squid eggs measuring 0.6-1.0 mm in diameter need one to two months to develop to hatching. At c. 2 C, the embryonic development of these small eggs would probably cover between three and five months. Very large octopod eggs are known to develop over time spans of at least one year. Protection of the developing embryos either by long-lasting capsules laid at appropriate spawning sites, or by active 'brooding' (incirrate octopods) is required for embryonic survival and hatching success. The physiological conditions controlling the onset of hatching at very low temperatures are unknown; postponement of hatching appears to be common in cold waters. (Auth.)

B-50563

Brierley, A.S., Thorpe, J.P., **Biochemical genetic evidence supporting the taxonomic separation of *Loligo gahi* from the genus *Loligo***, *Antarctic science. Special issue*, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.143-148, Refs. p.147-148.

Fifteen specimens of *Loligo gahi* caught within the Falkland Is. Interim Conservation and Management Zone during Mar. 1988 were subject to genetic analysis using horizontal starch gel electrophoresis. Comparison of allele frequencies at 22 clearly resolving putative enzyme loci showed these animals to exhibit a degree of genetic differentiation from samples of *Loligo forbesi* and *Loligo vulgaris vulgaris* (I=0.19 and 0.22 respectively) greater than that normally expected between congeneric species. The degree of difference was of the order typically exhibited between members of different but confamilial genera, for example as here between *L. forbesi* and *Alloteuthis subulata* (I=0.22). It is therefore concluded that *L. gahi* should no longer be regarded as a member of the genus *Loligo*. Genetic analysis of further species is necessary to clarify whether or not *L. gahi* should, as has been suggested on morphological grounds, be united in a separate genus with other American myopsid species also currently ascribed to the genus *Loligo*. (Auth.)

B-50564

Croxall, J.P., Prince, P.A., **Dead or alive, night or day: how do albatrosses catch squid**, *Antarctic science. Special issue*, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.155-162, Refs. p.161-162.

For many albatross species squid are important prey. Whether albatrosses depend on scavenging (e.g. of vomit from cetaceans, post-spawning die-offs or fishery waste) or on live-capture of squid (e.g. via diel vertical migrations in association with aggregations of squid prey) is controversial. This review of the nature of interactions between squid and the 4 species of albatross breeding at South Georgia uses data on the foraging range, methods and timing of feeding of the albatrosses in relation to the size, distribution, buoyancy characteristics (floaters or sinkers), bioluminescence and prey of the squid and access to fishery waste. It is concluded that most evidence for scavenging needs critical re-evaluation; nevertheless, whereas wandering albatrosses and possibly light-mantled sooty albatrosses probably depend significantly on scavenged squid, black-browed and especially grey-headed albatrosses are unlikely to do so. (Auth.)

B-50565

Daly, H.I., Rodhouse, P.G., **Comparative morphology of two sympatric *Pareledone* species from South Georgia**, *Antarctic science. Special issue*, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.163-169, 20 refs.

Morphometric data were collected for 410 specimens of *Pareledone turqueti* and *P. polymorpha* caught around South Georgia. The two species differ in beak morphology and in the male hectocotylus. The species have similar appearances although there is a small but significant difference in the mantle length/body mass relationship for females, with *P. polymorpha* having a relatively longer mantle. There is no significant difference in the arm length/body mass relationship between species or sexes ($p > 0.05$), except in the case of arm IV of females. There is an interspecific significant difference between sucker number on arms I and II of males, arms I-IV of females, and between hood length and size of the buccal mass ($p < 0.05$), with *P. turqueti* having relatively lower sucker numbers, a longer hood length and greater buccal mass. The beak of *P. turqueti* is similar to that of *Eledone* spp. but *P. polymorpha* has a small, fine beak with the rostral tip ending in an elongated, sharp point. Differences in beak and buccal mass suggest that these sympatric species occupy distinct trophic niches and that the differing morphology of the male hectocotylus is a factor in reproductive isolation. (Auth.)

B-50566

Filippova, J.A., Pakhomov, E.A., **Young squid in the plankton of Prydz Bay, Antarctica**, *Antarctic science. Special issue*, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.171-173, 11 refs.

A collection of juvenile squid were caught with an Isaacs-Kidd mid-water trawl (IKMT) and Juday plankton net at 86 stations in Prydz Bay to a depth of 500 m but mostly at 0-200 m. Five species were identified: *Psychroteuthis glacialis*, *Alluroteuthis antarcticus*, *Brachioteuthis* sp. and the cranchiids *Galiteuthis glacialis* and *Mesonychoteuthis hamiltoni*. *P. glacialis* and the cranchiids were the most abundant species. Young *P. glacialis* (5-17 mm ML) were taken at depths of 5-200 m but concentrated in the upper 100 m whilst the cranchiids (5-35 mm ML) occurred over a wider vertical range (50-500 m). The regular occurrence of paralarvae and juveniles suggests that all the species reproduce in the Antarctic. Juvenile vertical distribution appears to differ between species with *P. glacialis* concentrated relatively near the surface, the cranchiids in the upper part of the Circumpolar Deep Water and *A. antarcticus* widely distributed to a depth of 900 m. (Auth.)

B-50567

Guerra, A., Castro, B.G., **Reproductive-somatic relationships in *Loligo gahi* (Cephalopoda: Loliginidae) from the Falkland Islands**, *Antarctic science. Special issue*, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.175-178, Refs. p.177-

178.

Samples of *Loligo gahi* from the Falkland Is. Interim Conservation and Management Zone collected in Mar. 1987 were analyzed to determine the relationships between mass of reproductive and somatic organs during maturation. There was a progressive increase in mass of the reproductive organs with growth in males, while in females these organs did not show a conspicuous increase in mass until a body mass of c. 40 g was reached. No change was found in the mass of the digestive gland in relation to body mass or in the water content of male and female somatic tissues during maturation. Growth of reproductive organs in *L. gahi* seems to be supported by diet and not at the expense of somatic tissue. (Auth.)

B-50568

Hatfield, E.M.C., Rodhouse, P.G., **Migration as a source of bias in the measurement of cephalopod growth**, *Antarctic science. Special issue*, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.179-184, 31 refs.

Theory predicts that, in a closed exploited population showing no sampling or other bias, the mean age of fish or squid between one sampling date and the next should increase by the time interval between samples. Age data derived from statoliths have been used to test the hypothesis that the effect of migration through an area where a population of *Loligo gahi* is sampled would be apparent as an increase in mean age per modal group of less than one day per daily time interval between samples. The data show that, in both females and males, the relationship between mean statolith increment number and elapsed time between samples is positive in some months and negative in others. The present study shows that putative age data derived from statoliths apparently demonstrate some sampling biases within a fishery and their effects on the measurement of growth. Migration through the sampled population is manifested by an increase in mean increment number of less than one per day between samples, and growth can only be assessed where the increase in mean increment number is not significantly different from the time elapsed between samples. (Auth. mod.)

B-50569

Jackson, G.D., Lu, C.C., **Statolith microstructure of seven species of antarctic squid captured in Prydz Bay, Antarctica**, *Antarctic science. Special issue*, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.195-200, 36 refs.

The statolith microstructure was examined from 7 species of 7 families of squid captured in Prydz Bay. Five of the species (*Kondakovia longimana*, *Psychroteuthis glacialis*, *Brachioteuthis* sp., *Mastigoteuthis psychrophila*, *Galiteuthis glacialis*) had very clear statolith growth increments which could be enumerated from the nucleus to the statolith margin. These increments were similar in appearance to daily statolith increments in other temperate and tropical squids. *P. glacialis* also had two distinct zones which may reflect growth during the pelagic and demersal phases of the life cycle. Total statolith increment counts were not possible on two of the species (*Bathyteuthis abyssicola* and *Alluroteuthis antarcticus*). The statolith microstructure of *B. abyssicola* had some very faint increments near the nucleus but increments were not visible in most of the statolith microstructure, while the statolith microstructure of *A. antarcticus* was indistinct in the nuclear region (possibly due to the formation of a second primordium during ontogenesis). Future research may reveal that statolith increments are useful tools for antarctic squid age and growth studies. (Auth.)

B-50570

Kubodera, T., Okutani, T., **Eledonine octopods from the southern ocean: systematics and distribution**, *Antarctic science. Special issue*, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.205-214, 24 refs.

Forty-four octopods from bottom trawls off Palmer Archipelago, southeastern Argentina, southeastern New Zealand, Crozet Is. and Showa Station were examined. Three species of *Pareledone*, 3 species of *Graneledone* and one species of *Megaleledone* were identified. All were characterized by having a single row of arm suckers. Mature males of *P. harrissoni*, *P. adeliaeana* and *G. macrotyla* were recorded for the first time.

Hectocotylus and male reproductive organs of these species are described. On the basis of previously reported distributions and the present localities, *P. charcoti*, *P. harrissoni* and *P. adeliaeana* appear to have circumantarctic distributions. *G. macrotyla* was identified but the other two species of *Graneledone* could not be identified to species level because of the poor systematic state of this genus. (Auth.)

B-50571

Lu, C.C., Williams, R., **Contribution to the biology of squid in the Prydz Bay region, Antarctica, *Antarctic science. Special issue***, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.223-229, 21 refs.

The teuthoid fauna of the Prydz Bay region has been studied based on the material collected from 1981-1991 using a rectangular midwater trawl (RMT-8), pelagic trawl (IYGPT), and bottom trawl. Eight species of squid have been recognized: *Brachioteuthis* sp., *Kondakovia longimana*, *Bathyteuthis abyssicola*, *Psychroteuthis glacialis*, *Alluroteuthis antarcticus*, *Mastigoteuthis psychrophila*, *Mesonychoteuthis hamiltoni* and *Galiteuthis glacialis*. Size frequency distribution, geographical and vertical distributions of each species as well as diets of common species are analyzed. There is no evidence of a diel vertical migration but ontogenetic descent appears to occur in *P. glacialis* and *G. glacialis*. Antarctic krill *Euphausia superba* and the antarctic silverfish *Pleuragramma antarcticum* are important prey for most species with cannibalism occurring in *P. glacialis*, *A. antarcticus* and *M. hamiltoni*. Equations for calculating total weight from mantle length, and mantle length and total weight from upper and lower rostral length are provided for *B. abyssicola*, *P. glacialis*, *A. antarcticus*, *M. psychrophila*, and *G. glacialis*. (Auth.)

B-50572

Lu, C.C., Williams, R., ***Kondakovia longimana* Filippova, 1972 (Cephalopoda: Onychoteuthidae) from the Indian Ocean sector of the southern ocean, *Antarctic science. Special issue***, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.231-234, 27 refs.

Two specimens of *Kondakovia longimana* were recently obtained from Prydz Bay. One specimen, damaged but near the known maximum size, was found floating on the surface, and the other, a male subadult specimen, was captured by a pelagic trawl. Examination of the specimens, histological sections and analyses of tissue samples revealed that the muscular tissues of the tentacular stalks and the mantle contain a large amount of ammonium, more than 328 mM, a quantity that far exceeds that of *Moroteuthis ingens* (206.9 mM) and *Moroteuthis rosoni* (199.6 mM) from the South Tasman Rise. Catch data and published records suggest that the juveniles and subadults of *K. longimana* feed on krill in the epipelagic zone. (Auth.)

B-50573

Piatkowski, U., Hagen, W., **Distribution and lipid composition of early life stages of the cranchiid squid *Galiteuthis glacialis* (Chun) in the Weddell Sea, Antarctica, *Antarctic science. Special issue***, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.235-239, Refs. p.238-239.

The relatively small numbers of pelagic cephalopods caught in the RMT-8 samples (0-300 m) in Feb.-Mar. 1983 in the Weddell Sea were dominated by early life stages of the cranchiid squid *Galiteuthis glacialis*. A total of 48 specimens were caught with dorsal mantle length (ML) ranging from 4-36 mm. They occurred with a mean density of 0.15 ind. x 1000/m³ and were present in 38% of 33 RMT-8 samples. *G. glacialis* was the only cranchiid squid found in the Weddell Sea between 66 and 74S. Its early life stages were concentrated in the layers below the summer thermocline (>50 m) and body sizes appeared to increase towards deeper water layers. For biochemical analyses, 9 specimens of *G. glacialis* (ML 6-18 mm) were sampled in the eastern Weddell Sea between 185-520 m water depth in Jan.-Feb. 1985. Total lipid contents ranged from 8-11% dry weight (DW) with phospholipids being the main lipid component (43-56% of total lipid). Storage lipids (triacylglycerols) made up 18-26% of total lipid. The relatively low lipid contents may reflect the early developmental stage of the specimens examined. (Auth. mod.)

B-50574

Piatkowski, U., Pütz, K., **Squid diet of emperor penguins (*Aptenodytes forsteri*) in the eastern Weddell Sea, Antarctica during late summer, *Antarctic science. Special issue***, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.241-247, 43 refs.

The diet of 58 adult Emperor penguins on the fast ice of Cape Vestkapp was investigated. Prey consisted principally of squid, fish, krill, amphipods and isopods. Squids were identified by the lower beaks and allometric equations were used to estimate the squid biomass represented. Beaks occurred in 93% of the stomach samples. Each sample contained a mean of 27 beaks (range 1-206). Ninety-two percent of the squids could be identified by the lower beaks and belonged to 4 families (Onychoteuthidae, Psychroteuthidae, Neoteuthidae and Gonatidae). The most abundant squid was *Psychroteuthis glacialis* which occurred in 52 samples. In terms of biomass *K. longimana* was the most important species taken by the penguins, comprising 50% of total estimated squid wet mass (245.348 g) in 1990 and 48% in 1992 (154.873 g). However, if only fresh beaks were considered for estimations of squid consumption, i.e. beaks that have been accumulated for not longer than 5-6 days in the stomachs, squid diet was of minor importance. Then total squid wet mass accounted for only 4809 g in 1990 and 5445 g in 1992, which implies that one penguin took c. 30 g squid/d with *P. glacialis* and *A. antarcticus* being the most important by mass. (Auth. mod.)

B-50575

Rodhouse, P.G., et al, **Growth, age structure and environmental history in the cephalopod *Martialia hyadesi* (Teuthoidea: Ommastrephidae) at the Antarctic Polar Front Zone and on the Patagonian Shelf Edge, *Antarctic science. Special issue***, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.259-267, Refs. p.266-267.

Martialia hyadesi were collected from fishing vessels at the Antarctic Polar Frontal Zone (APFZ) and the Patagonian Shelf Edge (PASE) during the 1989 autumn and winter. Squid were measured, weighed, assigned a maturity stage and the paired statoliths were removed. Statolith sections revealed concentric growth rings using light and scanning electron microscopy. Counts of these putative daily micro-growth increments were made directly and by an estimating procedure. Energy dispersive (ED) and wavelength dispersive (WD) x-ray analyses of Sr and Ca content were made on subsamples of statolith sections. Estimated increment counts, which were generally higher than direct counts, were adopted for routine application. Back calculated hatching dates showed that a single cohort, with a relatively narrow size range, was sampled in each geographical area. Back calculations suggested that *M. hyadesi* at the APFZ had hatched in the austral winter and those at the PASE had hatched in the spring. At the PASE, growth rate was estimated to be some 30% higher than at the APFZ and PASE squid were more mature at a given age. The hypothesis that the Sr:Ca ratio along the growth axis of the statolith contains information on thermal history was examined. (Auth. mod.)

B-50576

Thompson, K.R., **Predation on *Gonatus antarcticus* by Falkland Islands seabirds, *Antarctic science. Special issue***, June 1994, 6(2), Southern ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.269-274, 25 refs.

Recent studies of Falkland Is. seabird diets have found that *Gonatus antarcticus* is a major prey item for a number of penguin species. Rockhopper, Gentoo and Magellanic penguins breeding in the Falklands are estimated to consume several thousand million *Gonatus* per annum, with mean dorsal mantle lengths of 28-42 mm. Aspects of the distribution and growth of the *G. antarcticus* stock in the vicinity of the Falkland Is. are discussed. (Auth.)

B-50577

Vacchi, M., Greco, S., La Mesa, M., ***Kondakovia longimana* Filippova, 1972 (Onychoteuthidae) from Terra Nova Bay, Ross Sea, *Antarctic science. Special issue***, June 1994, 6(2), Southern

ocean cephalopods: life cycles and populations. Edited by P.G. Rodhouse, U. Piatkowski and C.C. Lu, p.283, 3 refs.

Morphometric data, including indices expressed as percent of the mantle length, are given for a large female *Kondakovia longimana* specimen found floating in Terra Nova Bay in Jan. 1991. It is noted that the specimen is the largest whole *Kondakovia longimana* caught so far, and it is the southernmost record of this species.

B-50579

Schmiedl, G., Mackensen, A., *Cornuspiroides striolatus* (Brady) and *C. rotundus* nova spec.: large miliolid foraminifera from arctic and antarctic oceans, *Journal of foraminiferal research*, Oct. 1993, 23(4), p.221-230, 44 refs.

Large miliolid benthic foraminifera of the family Cornuspiridae were investigated from 15 arctic and antarctic localities. The genus *Cornuspiroides* Cushman is discussed in detail and a new species *C. rotundus*, comprising an antarctic evolutionary line, is differentiated by morphometric analysis from the Arctic *C. striolatus* (Brady). The potential evolutionary lines and the ecology of the two closely related species are discussed in relation to substrate and water mass characteristics as well as standing stocks and diversities of associated life and dead benthic foraminiferal faunas. (Auth.)

B-50582

Kattner, G., Graeve, M., Hagen, W., Ontogenetic and seasonal changes in lipid and fatty acid/alcohol compositions of the dominant antarctic copepods *Calanus propinquus*, *Calanoides acutus* and *Rhincalanus gigas*, *Marine biology*, Mar. 1994, 118(4), p.637-644, 35 refs.

Lipid compositions of the dominant antarctic copepods *Calanoides acutus*, *Rhincalanus gigas* and *Calanus propinquus* from the Weddell Sea have been investigated in great detail. Copepods were collected during summer in 1985 and late spring/early winter in 1986. The analyses revealed specific adaptations in the lipid biochemistry of these species which result in very different lipid components. Details of these adaptations and components include, among others, synthesis of wax esters, fatty acids, fatty alcohols, triacylglycerols, and poly- and mono-unsaturates. Seasonal and age differences in dry weight and lipid contents are noted and discussed. (Auth. mod.)

B-50583

Färber-Lorda, J., Length-weight relationships and coefficient of condition of *Euphausia superba* and *Thysanoessa macrura* (Crustacea: Euphausiacea) in southwest Indian Ocean during summer, *Marine biology*, Mar. 1994, 118(4), p.645-650, 36 refs.

Samples of antarctic euphausiids *Euphausia superba* and *Thysanoessa macrura* were obtained during the MD 25 FIBEX expedition of the R/V *Marion Dufresne* in Feb. 1981 to the southwest Indian Ocean. Individual and mean coefficients of condition (Km) were calculated from variations in weight as a function of total length and of carapace length. In *E. superba* no significant differences were found as a function of sex or development stage in either total length and weight or carapace length and weight. In *T. macrura*, a significant allometric difference emerged in the wet weight of juveniles, males and females as a function of total length, and in wet weight as a function of carapace length between adults and subadults. In both *E. superba* and *T. macrura*, wet weight as a function of total length differed significantly among stations, and also between species, with a greater weight increase for *T. macrura* in summer. The coefficients of condition calculated for all wet weight-total length relationships showed that the morphologically different Group II males were heavier than Group I males and mature females. Km in *T. macrura* was higher for females than for juveniles or males, indicating a greater weight gain by the females. These differences probably reflect real differences in physiology and may affect the distribution of these two species. (Auth.)

B-50591

Nordhausen, W., Distribution and diel vertical migration of the euphausiid *Thysanoessa macrura* in Gerlache Strait, Antarctica, *Polar biology*, May 1994, 14(4), p.219-229, Refs. p.228-229.

Thysanoessa macrura was found throughout Gerlache Strait during 4 surveys carried out from Oct. 30 to Nov. 23, 1989, with the highest abundance being 332 individuals/m² (0-290 m). Reproduction had begun just before the surveys took place, as indicated by the presence of females with attached spermatophores and of larvae. Thirteen-month old females were reproductive. Larvae in 9 depth strata between 0-290 m were dominated by calyptopis stages, and developed from calyptopis 1 to furcilia 1 during Nov. Larval abundance was not correlated to chlorophyll *a* concentration, which showed a consistent east-west gradient in Gerlache Strait with highest concentrations (>30 mg chlorophyll *a*/m³) in bays of the Antarctic Peninsula. Survival of larvae appeared to not be affected by phytoplankton abundance. Older *T. macrura* showed strong diel vertical migration between the surface at night and depths to 120 m during mid-day. Larvae were consistently found in the chlorophyll *a*-rich upper 50 m during night (90%) and day (81%), while adults and juveniles were found in the upper 50 m at night (83%), but only 16% remained there during the day. (Auth.)

B-50592

De la Mare, W.K., Kerry, K.R., Population dynamics of the wandering albatross (*Diomedea exulans*) on Macquarie Island and the effects of mortality from longline fishing, *Polar biology*, May 1994, 14(4), p.231-241, 30 refs.

The estimated breeding population of wandering albatrosses on Macquarie I. increased from 17 in 1956 to a maximum of 97 in 1966, and then declined at an average rate of 8.1% per year. Mark-recapture analysis shows that the population is not closed (i.e., subject to immigration and emigration). The decline is correlated with the onset of large-scale fishing for tuna in the Southern Hemisphere using longlines. The effect of longline mortality on the population dynamics of the wandering albatross is estimated. An annual number of longline hooks in the Southern Hemisphere tuna fishery of 41.6 million is calculated as the ceiling below which the population would begin to recover. (Auth.)

B-50593

Pagès, F., Kurbjewit, F., Vertical distribution and abundance of mesoplanktonic medusae and siphonophores from the Weddell Sea, Antarctica, *Polar biology*, May 1994, 14(4), p.243-251, Refs. p.250-251.

The composition, abundance and vertical distribution of mesoplanktonic cnidarians collected along a transect across the Weddell Sea have been analyzed. The transect was characterized by a thermocline, approximately between 200 and 100 m, which deepened significantly towards the shelf edges. In total, 10 species of medusae and 18 species of siphonophores were identified. The most abundant medusae were *Pantachogon scotti* (up to 11,671 specimens/1,000 m³) and *Arctapodema ampla* (up to 960 specimens/1,000 m³). The most abundant siphonophores were *Muggiaea bargmannae* (up to 1,172 nectophores/1,000 m³) and *Dimophyes arctica* (up to 230 nectophores/1,000 m³). Five assemblages of planktonic cnidarians were distinguished: epipelagic species located in and above the thermocline; epi- and upper mesopelagic species located in, above and just below the thermocline; epi- and mesopelagic species located in and below the thermocline; mesopelagic species; and lower mesopelagic species. Differences in the depth distribution of the various species gave rise to a clear partitioning of the mesoplanktonic cnidarian population throughout the water column. This vertical partitioning was related to the existence of a thermocline, the structure of the water column and the vertical distribution of prey. (Auth.)

B-50594

Bayly, I.A.E., *Gladioferens* Henry (Copepoda: Calanoida) discovered in Antarctica: *G. antarcticus* sp. nov. described from a lake in the Bunger Hills, *Polar biology*, May 1994, 14(4), p.253-259, 17 refs.

A new species of *Gladioferens* is described from a freshwater lake in the Bunger Hills: the White Smoke Lake. A key to the 6 species of *Gladioferens* is provided for both sexes. Most species of the subgenus containing *G. antarcticus* n. sp. are remarkable in possessing asymmetries in the second legs (male) and fourth legs (female). This suggests that the mating behavior of these species may be radically different from that in most heterarthrandrian calanoids and calls for further study. However, *G. antarcticus* is more primitive than its consubgenera in having, in the male, symmetrical second legs and 3-segmented endopods in the fifth legs. The

genus shows a highly disjunct distribution (Australia, New Zealand and Bunker Hills) and its biogeography is now of outstanding interest. (Auth. mod.)

B-50595

García, F.J., García Gómez, J.C., Troncoso, J.S., Cervera, J.L., **Descriptive study of some antarctic notaspidean opisthobranchs (Gastropoda), with description of a new genus and species, *Polar biology***, May 1994, 14(4), p.261-268, 18 refs.

During the expedition "ANTARTIDA 9101" to the South Orkney Is., 4 specimens of notaspidean gastropods were collected. Three of them have been identified as *Bathyberthella antarctica* Willan and Bertsch, 1987. However, one specimen, although externally similar to *B. antarctica*, had an internal anatomy exhibiting features that have enabled the authors to consider it to be a new genus and species. This new taxon is characterized by the presence of jaws without mandibular elements, and a vaginal gland that partially surrounds the distal region of the vaginal duct. In this paper the new genus and species is described. Additional anatomical data of the specimens of *B. antarctica* collected during the expedition are included. (Auth.)

B-50596

Woehler, E.J., Penney, R.L., Creet, S.M., Burton, H.R., **Impacts of human visitors on breeding success and long-term population trends in Adélie Penguins at Casey, Antarctica, *Polar biology***, May 1994, 14(4), p.269-274, 21 refs.

Breeding populations of Adélie penguins have been counted at two localities near Casey Station since 1959-60 and 1968-69. At Whitney Point, the breeding population increased from 1122 pairs in 14 colonies in 1959-60 to 4714 pairs in 36 colonies in 1992-93. On Shirley I., the total breeding population has remained at 7770 pairs +/- 10% between 1968-69 and 1992-93, except in 1990-91 when the population peaked at 8719 pairs. An association between the age of a colony and its rate of increase was observed at Whitney Point. At Shirley I., where most of the colonies extant in 1968-69 have decreased in population, the establishment and growth of 13 colonies has offset this decrease; these new colonies also exhibited the association between age and rate of increase. Breeding success (chicks fledged per nest) was significantly lower for Shirley I. colonies than for those at Whitney Point. Human visitors to Shirley I. from Casey Station are believed to be responsible for the observed changes in the distribution and abundance of breeding pairs and for maintaining the stable population by reducing overall breeding success through the disturbance associated with visits. (Auth. mod.)

B-50597

Hindell, M.A., Slip, D.J., Burton, H.R., **Body mass loss of the moulting female southern elephant seals, *Mirounga leonina*, at Macquarie Island, *Polar biology***, May 1994, 14(4), p.275-278, 19 refs.

Thirteen female southern elephant seals moulting at Macquarie I. lost an average of 4.46 kg/day (10.01 g/kg/day). There was no significant difference between this rate of body mass loss and that reported for moulting female southern elephant seals from South Georgia. Moulting female southern elephant seals however exhibited larger specific mass loss than either female northern elephant seals or male southern elephant seals, indicating a higher metabolic cost of moult in these animals. (Auth.)

B-50598

Capriglione, T., et al, **Satellite DNAs, heterochromatin and sex chromosomes in *Chionodraco hamatus* (Channichthyidae, Perciformes), *Polar biology***, May 1994, 14(4), 285-290, Refs. p.289-290.

The genome of the antarctic ice fish *Chionodraco hamatus* was studied to detect highly repetitive DNAs that may play a role in heterochromatinization processes and sex chromosome differentiation. Two different experimental approaches were used. Hybridization of a Bkm probe to genomic DNA showed slight differences between the two sexes. Using restriction enzymes, a Bgl II satellite (pIF) was isolated. *In situ* hybridization revealed a preferential localization of pIF on the centromeres and the telomeres of most chromosomes, as well as an interstitial band on the long arms of the neo-Y sex chromosome, where probably the hypothetical fusion took place. Dot-blot experiments showed that pIF is still present in

species belonging to different families of the same suborder. Though preliminary, results suggest a conservative nature of this DNA which might have played a definite functional role in the genome of these polar fishes. (Auth.)

B-50608

Weiler, C.S., ed, Penhale, P.A., ed, **Ultraviolet radiation in Antarctica: measurements and biological effects, *American Geophysical Union. Antarctic research series***, 1994, Vol.62, 257p., Refs. passim. For individual papers see B-50614 through B-50623, I-50609 through I-50613 or 48-4380 through 48-4389.

DLC QH84.2.U515

This volume consolidates the wide range of research conducted in Antarctica since the late 1980s in the fields of ultraviolet radiation climatology and biological effects, and provides an overview of research efforts by scientists from a number of antarctic research programs. Presented here are 15 papers; some provide detailed research results, while others are overviews. Topics include ultraviolet radiation measurements, monitoring, and mapping; the roles of ozone and clouds on surface ultraviolet-B irradiance; ultraviolet tolerance mechanisms in antarctic marine organisms; ultraviolet radiation effects on marine phytoplankton, ice algae, and cyanobacteria; and ultraviolet radiation effects on terrestrial cyanobacteria, algae, and cryptogams.

B-50615

Karentz, D., **Ultraviolet tolerance mechanism in antarctic marine organisms, *American Geophysical Union. Antarctic research series***, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.93-110, Refs. p.108-110.

DLC QH84.2.U515

The ecological consequences of springtime ozone depletion over the Antarctic are directly correlated with the tolerance of species to ultraviolet-B radiation (UV-B) and the stability of trophic relationships under this potential biological stress. Tolerance is dependent on the effectiveness of protective strategies that serve to reduce exposure to UV-B; repair capabilities can influence the survival, growth, and reproductive success of a species under UV-B stress. Research conducted on the UV photobiology of antarctic organisms indicates a wide range of sensitivity to UV exposure. It has been established that antarctic species have means for protection and repair that are identical to those found in organisms from other latitudes. These include the presence of UV-absorbing molecules (mycosporine-like amino acid compounds) and the existence of DNA repair pathways (photoreactivation and excision repair). The full range of tolerance to UV-B exposure and the thresholds for lethality in antarctic communities have not yet been determined. The lack of data on species-specific responses to increased UV-B is a primary limitation to the quantitative evaluation of the ecological impact of ozone depletion in this region. (Auth.)

B-50616

Vincent, W.F., Quesada, A., **Ultraviolet radiation effects on cyanobacteria: implications for antarctic microbial ecosystems, *American Geophysical Union. Antarctic research series***, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.111-124, Refs. p.121-124.

DLC QH84.2.U515

Cyanobacteria are ubiquitous, often dominant components of antarctic terrestrial and freshwater communities. Many of these communities live in habitats such as shallow ponds, rock faces, glacial moraines, and streambeds that are exposed to direct solar radiation. UV exposure can cause specific cytotoxic lesions in cyanobacteria such as DNA base dimers and photosystem II (PSII) inactivation, but it also has a range of general debilitating effects associated with protein damage and pigment photooxidation. These responses are a function of wavelength, intensity, and duration of exposure. Like many other phototrophs, cyanobacteria have four lines of defence against UV exposure: avoidance, screening, quenching, and repair. However, there are large differences among species, including antarctic species, in their ability to cope with UV. Intense solar radiation can impair some of these defence mechanisms. The changing UV-B flux over Antarctica is not likely to cause an abrupt decline in productivity in these microbial ecosystems, but it may cause changes in community struc-

ture. The dispersal and primary colonization phases in antarctic terrestrial environments may be especially vulnerable to UV-B radiation early in or before the growing season, such as during the period of spring ozone depletion. At this time of year the microorganisms are still frozen and their biosynthetic repair mechanisms are unlikely to be operational. Any photochemical damage incurred during this period may remain unchecked and cumulative until cellular metabolism resumes in summer. (Auth.)

B-50617

Neale, P.J., Lesser, M.P., Cullen, J.J., **Effects of ultraviolet radiation on the photosynthesis of phytoplankton in the vicinity of McMurdo Station, Antarctica, American Geophysical Union. Antarctic research series**, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.125-142, Refs. p.140-142.

DLC QH84.2.U515

Biological weighting functions (BWFs), or action spectra, of ultraviolet (UV) inhibition of photosynthesis were estimated for phytoplankton growing near McMurdo Station during the 1991 austral spring. Like temperate phytoplankton in culture, antarctic assemblages were inhibited by both ultraviolet-B radiation (UV-B, 280-320 nm) and ultraviolet-A radiation (UV-A, 320-400 nm). Antarctic assemblages were also inhibited by exposure to photosynthetically available radiation (PAR, approximately 400-700 nm) at intensities ($<250 \text{ W/m}^2$) which did not affect the temperate cultures. The BWF determined for marine phytoplankton growing in enclosures which simulated conditions in the marginal ice zone had smaller weights (less UV sensitivity) relative to a BWF previously determined for a temperate diatom (*Phaeodactylum*) culture. There was no significant difference in UV sensitivity between assemblages grown in UV opaque and UV transparent enclosures. Phytoplankton sampled below the perennial 4 m-thick ice cover of Lake Bonney were very sensitive to photoinhibition by both UV and PAR, though weights in the UV-B were only slightly higher than for *Phaeodactylum*. The results show that BWFs for UV inhibition of phytoplankton photosynthesis vary both in the absolute magnitude and the relative effect of UV-B versus UV-A. (Auth. mod.)

B-50618

Vernet, M., Brody, E.A., Holm-Hansen, O., Mitchell, B.G., **Response of antarctic phytoplankton to ultraviolet radiation: absorption, photosynthesis, and taxonomic composition, American Geophysical Union. Antarctic research series**, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.143-158, Refs. p.157-158.

DLC QH84.2.U515

The relationship between photosynthetic inhibition, ultraviolet (UV) absorption, and pigmentation in antarctic phytoplankton in relation to UV irradiance (280-400 nm) was studied during two cruises to the western coast of the Antarctic Peninsula during spring/summer of 1988 and 1991. *In vivo* UV absorption of phytoplankton exhibited a maximum at 330-335 nm; its magnitude was dependent on phytoplankton taxonomic composition and to a lesser degree on optical depth in the water column. Prymnesiophyte-dominated populations had a high *in vivo* absorption at 330 nm, while cryptomonad-dominated populations had low UV absorption. Samples with low photosynthetic enhancement had high pigment-specific UV absorption at 330 nm (sq m per milligram chlorophyll-*a* per hour). Although 71% of the variance associated with photosynthetic enhancement was explained by UV-B dose over the full range of doses, the maximum dose for samples with high UV absorption at 330 nm was $1500 \text{ W/cm}^2/\text{nm s}$, or about 25% of the maximum dose. The reduced photosynthetic enhancement observed in samples with high UV absorption supports the hypothesis that UV-absorbing compounds are photoprotective and suggests that algae capable of synthesizing and/or accumulating UV-absorbing compounds are less susceptible to UV radiation than algae with no UV-absorbing compounds. (Auth. mod.)

B-50619

Prézelin, B.B., Boucher, N.P., Smith, R.C., **Marine primary production under the influence of the antarctic ozone hole: Icecolors '90, American Geophysical Union. Antarctic research series**, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale,

p.159-186, Refs. p.184-186.

DLC QH84.2.U515

Serious concerns exist that the thinning of atmospheric ozone, and associated enhancement of UV-B radiation, may impair marine primary productivity. Thus it is essential to quantify O_3 -related effects on aquatic ecosystems under natural conditions and to elucidate regulating mechanisms underlying UV-B impairment of phytoplankton biology. In the austral spring of 1990 an antarctic field study (Icecolors '90) successfully employed a sampling strategy, in combination with state-of-the-art optical instrumentation, to quantify the reduction of marine primary production as a function of natural fluctuations and O_3 -dependent increases in UV-B radiation, as well as O_3 -independent changes in UV-A radiation. Findings are presented which may improve substantially the ability to predict changes in rates of carbon fixation within phytoplankton communities experiencing O_3 -related enhanced UV-B radiation. (Auth.)

B-50620

Davidson, A.T., Marchant, H.J., **Impact of ultraviolet radiation on *Phaeocystis* and selected species of antarctic marine diatoms, American Geophysical Union. Antarctic research series**, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.187-205, Refs. p.203-205.

DLC QH84.2.U515

Production of ultraviolet-absorbing compounds, survival, and growth rate of the prymnesiophyte *Phaeocystis pouchetii* and selected species of antarctic diatoms after irradiation were investigated in laboratory experiments. *In situ* growth and primary production during irradiation and survival and growth after exposure were measured in antarctic coastal waters. The colonial stage in the life cycle of *Phaeocystis* was found to contain high concentrations of UV-B absorbing compounds which provide protection from UV irradiation. In contrast, the diatoms contained low concentrations of these compounds but survived higher UV-B irradiances than colonial *Phaeocystis*. Diatoms appear to use other mechanisms to reduce UV-B induced mortality. Near-surface *in situ* incubations during Feb. 1992 showed that the flagellate stage of *Phaeocystis* was the only alga examined which suffered severe mortality as a result of natural UV irradiances but that UV-A was responsible for most of this mortality. At sublethal irradiances, interspecific differences in production, *in situ* growth, and growth after irradiation were observed. Under the lower UV intensities experienced *in situ* these differences could lead to changes in phytoplankton species composition. (Auth.)

B-50621

Helbling, E.W., Villafañe, V., Holm-Hansen, O., **Effects of ultraviolet radiation on antarctic marine phytoplankton photosynthesis with particular attention to the influence of mixing, American Geophysical Union. Antarctic research series**, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.207-227, Refs. p.225-227.

DLC QH84.2.U515

During the austral spring-summer of 1988 to 1992 various types of experiments were done with natural assemblages of antarctic phytoplankton in order to estimate the effects of ultraviolet radiation (UVR) on rates of primary production as well as on species composition. All experiments used natural solar radiation, both with and without various sharp cutoff filters or a neutral density filter. *In situ* studies reveal that under normal ozone column concentrations of 300-350 Dobson units (DU) phytoplankton photosynthesis in the upper 20 m was decreased by as much as 8.2% due to ultraviolet-B (UV-B) radiation (280-320 nm), while the shorter wavelengths (320-360 nm) of ultraviolet-A radiation decreased carbon uptake by 10.3%. Under an extreme ozone hole (150 DU) an additional 6.4% carbon loss in the upper 20 m would be expected because of enhanced UV-B radiation. The phylogenetic groups represented in phytoplankton samples seemed to show differential sensitivity to UVR, flagellates being the most sensitive and diatoms the least sensitive. Diatoms, which apparently can synthesize relatively high concentrations of UV-B-absorbing compounds, tended to dominate the phytoplankton crop at stations with shallow upper mixed layers; at stations with deep mixed layers (more than 40 m), flagellates dominated the crop. (Auth. mod.)

B-50622

Ryan, K.G., Beaglehole, D., **Ultraviolet radiation and bottom-ice algae: laboratory and field studies from McMurdo Sound, Antarctica**, *American Geophysical Union. Antarctic research series*, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.229-242, Refs. p.241-242.

DLC QH84.2.U515

The authors have measured the ultraviolet-B (UV-B, 280-320 nm) radiation that falls onto sea ice in McMurdo Sound and found that incident fluxes approximately doubled as a result of the ozone hole in the spring of 1990. Multiple scattering due to the high surface albedo meant that polarization of the radiation was low, reaching a maximum of 40%. A simple power law relationship between air mass and intensity was found and used to describe daily averaged total irradiances, once a surface albedo factor was included. The effect of UV-B radiation on sea-ice algae was studied in the laboratory, and a 5% reduction in photosynthetic production for UV-B levels equivalent to those expected under 1.8 m-thick sea ice was observed. *In situ* studies modifying the UV-B radiation falling onto algae showed that low-level enhancement of UV-B radiation had no effect on chlorophyll-*a* content per cell, but the elimination of UV-B from the incident radiation produced a significant increase. Together these results suggest that the present conditions of elevated UV-B radiation due to ozone depletion will have little effect on bottom sea-ice algae. (Auth. mod.)

B-50623

Wynn-Williams, D.D., **Potential effects of ultraviolet radiation on antarctic primary terrestrial colonizers: cyanobacteria, algae, and cryptogams**, *American Geophysical Union. Antarctic research series*, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.243-257, Refs. p.254-257.

DLC QH84.2.U515

Although ice-free land constitutes only approximately 2% of Antarctica, it supports a variety of terrestrial habitats whose primary producers are dependent on photosynthetically active radiation for energy. They are therefore vulnerable to damage by concomitant ultraviolet radiation (UVR). There are three biological strategies against UVR damage available to terrestrial organisms: prevention (screening and quenching), behavior (avoidance and escape), and remedy (repair mechanisms). Potential screening pigments include mycosporine-like amino acids, flavonoids, and carotenoids. Avoidance strategies range from photomovement in response to ultraviolet-A radiation (UV-A) and visible radiation by soil-colonizing Oscillatoriales to the cryptoendolithic niche in dry valley rocks. This review discusses the effects of UVR on terrestrial colonizers, the strategies they use to minimize damage, terrestrial field methods used to quantify UVR, the implications of UVR damage for sensitive antarctic organisms and ecosystems, and the potential for future research, especially within the Scientific Committee on Antarctic Research international program of Biological Investigations of Terrestrial Antarctic Systems. (Auth.)

B-50636

Roos, P., et al, **Environmental radioactivity in the Antarctic Peninsula area**, *Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic*, Kirkenes, Norway, Aug. 23-27, 1993. Edited by P. Strand and E. Holm, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, p.183-194, 20 refs.

^{210}Pb , ^{137}Cs , $^{239+240}\text{Pu}$, ^{238}Pu , and ^{241}Am were analyzed in lichen, moss, grass and soil samples as well as in lake sediments from the South Shetland Is. in order to evaluate the flux and deposition of these elements. ^{210}Pb , ^{210}Po and ^{137}Cs were analyzed in water and macroalgae, and investigated in the foodchain. Activity concentrations of ^{137}Cs in seals, penguins and fish from the Antarctic Peninsula area were about 0.2-0.9 Bq/kg dry weight, 0.1-1 Bq/kg and 3-4 Bq/kg respectively, which is low but generally higher than expected from the integrated fallout deposition. The average activity concentration in water was 0.2 mBq/l. Activity concentrations of ^{210}Po were surprisingly high in liver and kidney of seals ranging from 50-250 Bq/kg and 30-200 Bq/kg respectively with a $^{210}\text{Po}/^{210}\text{Pb}$

ratio of 50-200. The results indicate a generally different transfer of radionuclides in the antarctic foodchain compared to other marine foodchains. (Auth. mod.)

B-50647

Hoshiai, T., ed, NIPR Symposium on Polar Biology, 15th, Tokyo, Dec. 9-10, 1992, **Proceedings of the NIPR Symposium on Polar Biology, N.7**, Tokyo, National Institute of Polar Research, 1994, 313p., Refs. passim. For selected papers see B-50648, B-50650 through B-50664 and J-50649.

This volume is a compilation of 25 full length papers and 6 abstracts (including extended abstracts), 17 of which are pertinent to Antarctica. The Symposium highlighted new technology for marine ecological studies and monitoring of polar terrestrial ecosystems. The program of the Symposium and an author index conclude this volume.

B-50648

Chen, B., **Distribution and abundance of choanoflagellates in Great-Wall Bay, King George Island, Antarctica in austral summer**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.32-42, 25 refs.

Eleven species of 7 genera of loricate choanoflagellates were found in a bay on King George I. during the sampling period from Jan. 22 to Feb. 8, 1991. Among them, *Pleurasiga orculaeformis* aff. was a new record in antarctic waters. The choanoflagellates' total abundance ranged from 5.1×10^3 to 5.3×10^4 cells/l. Their spatial distribution and abundance showed a heterogeneous pattern. The maximum concentration of chlorophyll *a* and the highest abundance of choanoflagellates were located at depths of 20 m and 30 m, respectively. Regression analysis on the basis of 40 data sets showed that there was a positive correlation between abundance of choanoflagellates and chlorophyll *a* concentration. The 4 dominant species of choanoflagellates, *Bicosta spinifera*, *Crinolina aperta*, *Diaphanoeca multiannulata* and *Parvicorbicula circularis*, were distributed widely from the surface to the bottom of the bay and accounted for more than 90% of total choanoflagellates in all layers: *B. spinifera* was up to about 41% of the mean value of surface abundance of total choanoflagellates. *D. multiannulata* reached the highest abundance of 2.2×10^4 cells/l at 20 m depth on Jan. 25. (Auth. mod.)

B-50650

Davidson, A.T., Marchant, H.J., **Comparative impact of *in situ* UV exposure on productivity, growth and survival of antarctic *Phaeocystis* and diatoms**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.53-69, Refs. p.67-69.

Depletion of stratospheric ozone over Antarctica enhances UV-B (280-320 nm) radiation reaching the Earth's surface during spring. UV-B influences the growth and survival of marine phytoplankton. The near surface UV irradiance, *in situ* growth and primary production of the prymnesiophyte *Phaeocystis* c.f. *pouchetii* (Hariot) Lagerheim and three diatoms were measured during UV exposure. Survival, growth and cell diameter were also determined after exposure. The flagellate stage in the life cycle of *Phaeocystis* was the only organism examined that suffered mortality as a result of natural UV exposure; however, UV-A (320-400 nm) was responsible for most of this mortality. Interspecific differences in production, cell concentration and growth were observed at sublethal irradiances. Such differences may lead to changes in phytoplankton species composition. (Auth.)

B-50651

Nishino, Y., Kawamura, A., **Winter gut contents of antarctic krill (*Euphausia superba* Dana) collected in the South Georgia area**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.82-90, 14 refs.

Foregut contents of krill, collected in the South Georgia area July 12-Aug. 4, 1992, were observed. A total of 130 individuals (adults: 78, subadults: 49, juveniles: 3) which were caught by krill trawling from various depths were examined in this study. The foregut contents consisted of various fragments of crustacean zooplankton in 77 individuals out of 130

examined. Among the fragments, a portion of the pereopods of krill was found from all specimens examined. Although the obtained materials were geographically confined to South Georgian waters, which were free from fast ice throughout the year, the results might imply that krill seemed to seasonally switch their food source. Krill demonstrates herbivorous food habits during rich phytoplankton bloom, but might change to carnivorous habits in the fall and winter. Strong cannibalistic food habits during the austral winter as found in this study are considered to be important for the population dynamics of krill. (Auth.)

B-50652

Gutt, J., Ekau, W., Gorny, M., **New results on the fish and shrimp fauna of the Weddell Sea and Lazarev Sea (Antarctic)**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.91-102, Refs. p.101-102.

A total of 151 demersal fishes and 555 shrimps were recorded on 1785 photographs which represent 1607 m² sea floor of the shelf and upper slope of the Weddell Sea (Halley Bay near-shore area) and of the Lazarev Sea. The Lazarev Sea showed a high number of species (24) and an average abundance of 7.24 n/100 m². In the Halley Bay near-shore area, only 11 species were found. The most abundant species were *Trematomus lepidorhinus* in the Lazarev Sea and *T. scotti* in the Halley Bay near-shore area by *Chorismus antarcticus* with an abundance of 33.45 n/100 m², whereas in the Lazarev Sea the 3 generally most abundant shrimps *C. antarcticus*, *Notocrangon antarcticus* and *Nematocarcinus lanceopes* showed values between 1.25 and 3.42 n/100 m². Between the two shelf-inhabiting species, *C. antarcticus* and *N. antarcticus*, no difference in depth zonation was found. A small scale analysis of the occurrence of *N. antarcticus* and *N. lanceopes* indicated random dispersion patterns at most investigated stations. (Auth. mod.)

B-50653

Rosa, R., et al, **Kinetic properties of pyruvate kinase purified from the flesh muscle of the antarctic krill *Euphausia superba* Dana**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.103-109, 17 refs.

In the present communication, some data on the kinetic properties of the pyruvate kinase (PK) purified from krill flesh muscle are shown. L-Phenylalanine inhibited this preparation of PK both in the presence and in the absence of 1 mM L-alanine. However, the inhibition of PK by Mg-ATP was almost completely reversed in the presence of 1 mM Fru-P₂, but not in the presence of 1 mM L-alanine. The Km values for PK have been established to be 0.03 microM PEP and 0.038 microM PEP, respectively, in the presence and in the absence of Fru-P₂. This flesh muscle preparation of PK shows clear sigmoidal kinetics. However, in the presence of Fru-P₂, PK shows Michaelian kinetics. The effect of ADP has also been established and found to have a Km value of 0.15 microM ADP. Cations inhibit krill's pyruvate kinase in the following order: Mn²⁺>Ca²⁺>Ni²⁺>Co²⁺, while Li²⁺ did not show any inhibitory effect. (Auth. mod.)

B-50654

Rodrigues, E., et al, **Effect of temperature on the kinetic properties of phosphofructokinase and hexokinase from the antarctic fish *Trematomus bernacchii***, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.110-117, 10 refs.

Phosphofructokinase (PFK) and hexokinase (HK) were concentrated by ammonium sulfate precipitation from *Trematomus bernacchii* epaxial and cardiac muscles respectively. The apparent Km of PFK for ATP and F6P was established at pH 8.0, at 4 different temperatures: 5, 11, 20 and 30 C. No significant effect of temperature on enzyme activity was observed, due to the fact that PFK does not exhibit allosteric properties at pH 8.0. However, at pH 7.0, in which condition the allosteric properties of PFK are displayed, it was observed that the rate of inhibition of the enzyme by ATP at 5 C is lower than at 20 C. Kinetic data of the allosteric behavior of PFK at pH 7.0 were assayed at 5 and 20 C in the presence of fixed concentrations of ATP and variable concentrations of F6P. From results obtained it was possible to conclude that the enzyme affinity with the substrate was 20 times higher at 5 C than at 20 C. This result seems to have high significance in regard to the mechanisms of biochemical adaptation of those

organisms at low temperatures. Values for energy of activation for both PFK and HK were also established. The apparent Km for HK from the cardiac muscle was equal to 384 microM and 599 microM at 5 C and 20 C, respectively. (Auth.)

B-50655

Macaulay, M.C., **Applications of hydroacoustics in marine ecological studies: a perspective on the present status and future directions**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.118-132, Refs. p.131-132.

Marine ecological studies of zooplankton and fish can greatly benefit from the application of hydroacoustic measurements. These measurements can be accomplished using off-the-shelf hardware and software. Hydroacoustic sampling equipment is widely available using various methods, for example, single beam, dual beam, and split beam systems. Each method has attendant limitations and advantages in terms of the kinds of information produced and the costs associated with the acoustic equipment and the data processing following data collection. Combining direct samplers (i.e., nets) with hydroacoustic instruments can produce highly productive insights into relationships of organisms and their environment as well as interspecific relations. This paper presents some examples of currently available tools for making hydroacoustic observations using a number of different sensors, examples of how the resulting data can be efficiently managed to allow detailed imaging of acoustic data, and how that information can be extracted and related to other observational or analytical data. A figure illustrates the use of a suspended acoustic system and downward fished net to observe the presence of euphausiids in the vicinity of pack ice in the Antarctic. (Auth. mod.)

B-50656

Wiebe, P.H., Greene, C.H., **Use of high frequency acoustics in the study of zooplankton spatial and temporal patterns**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.133-157, Refs. p.156-157.

Knowledge of the three-dimensional spatial structure of zooplankton populations and the change in this structure through time is fundamental to studies of plankton community dynamics. Although conceptual models portraying the time/space scales of plankton pattern and variability exist, data sets required to test their relationship to reality are lacking. High frequency acoustical systems (100 kHz to 1 MHz) are capable of simultaneously resolving individual zooplankton and mapping substantial ocean volumes. This approach provides investigators with new tools for investigating the processes controlling zooplankton distribution and abundance. The versatility of bioacoustical systems is exemplified by the variety of deployment modes already in existence, including use on submersibles, remotely operated vehicles, towed-bodies, net systems, moorings, and buoys. The processing and interpretation of bioacoustical data require substantial development. Theoretical models of volume backscattering from zooplankton and visualization of three-dimensional data sets are needed. A fundamental limitation in existing systems is the inability to discriminate and identify species. This is a basic impediment to the quantification of community composition. (Auth.)

B-50657

Matsumoto, G.I., **Geochemical monitoring of antarctic lakes and their ecosystems**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.158-172, Refs. p.169-172.

The monitoring of climatic changes, water quality, human activity, biomass, biological composition and biological activity in antarctic lakes and their ecosystems is discussed from a geochemical viewpoint. The changes in lake water levels, ice thickness and the periods of total melting and freezing of lake ice probably reflect climatic changes at the lake sites. Temperature, electric conductivity, pH, dissolved oxygen and redox potential in lake waters could be monitored continuously. Total organic and petroleum-derived hydrocarbons (such as gasoline, diesel fuels and lubricating oils) could be reflecting human activity in antarctic lakes near research stations. Chlorophyll *a* and/or fatty acid concentrations in lake

waters may be useful as markers of biomass. Direct microbial observation by biomarkers such as hydrocarbons, fatty acids and sterols are important to monitor biological composition in the lake. (Auth. mod.)

B-50658

Shivaji, S., Chattopadhyay, M.K., Ray, M.K., **Bacteria and yeasts of Schirmacher Oasis, Antarctica: taxonomy, biochemistry and molecular biology**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.173-184, Refs. p.183-184.

Water and soil samples from Schirmacher Ponds were found to contain a heterogenous group of psychrotrophic bacteria and yeasts. The bacteria belong to the genera *Pseudomonas*, *Sphingobacterium*, *Micrococcus*, *Planococcus* and *Arthrobacter*. The yeasts belong to the genera *Rhodotorula*, *Bullera* and *Candida*. Biochemical studies indicate that these psychrotrophs are capable of both translation and transcription even at 0°C and have enzymes which are cold-active, heat-labile and freeze-thaw resistant. Carotenoid pigments which interact with the bacterial membranes have been implicated in cold adaptation. Plasmids with antibiotic resistant genes have also been detected in some of the bacteria. Results are discussed with a view to obtaining possible insight into the biological basis of adaptation of microorganisms to low temperatures. (Auth.)

B-50659

Broady, P.A., Smith, R.A., **Preliminary investigation of the diversity, survivability and dispersal of algae introduced into Antarctica by human activity**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.185-197, 16 refs.

Human activity was found to be an effective vector for the dispersal of microalgae to the Ross Sea regions. A total of 50 taxa, mostly typical soil algae, were identified as potential colonizers. Sample material included dust on equipment and boots of expeditioners taken prior to boarding aircraft bound for Antarctica, and soil adhering to fresh vegetables imported into Scott Base. Ten taxa were from genera unrecorded in the Ross Sea regions. *Cylindrospermum* (Cyanophyta) and *Eustigmatorpha* (Eustigmatophyta) are relatively easily recognized and their spread could be monitored if they became established in antarctic habitats. However, there was no evidence of the establishment of any exogenous algae even in highly perturbed habitats close to Scott Base. Airborne dispersal within Antarctica was found to disperse algal propagules in the vicinity of Scott Base, although numbers were very low, being two orders of magnitude lower than those found in New Zealand. Strains isolated from dust on boots and equipment and from New Zealand air showed high survivability, as did the indigenous antarctic strains. In contrast, strains isolated from soil on fresh vegetables imported into Antarctica had low survival, similar to those isolated from a typical moist New Zealand garden soil. (Auth. mod.)

B-50660

Bölter, M., **Estimations of microbial biomass by direct and indirect methods with special respect to monitoring programs**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.198-208, Refs. p.206-208.

This review focuses on microbial biomass determination in antarctic terrestrial ecosystems. Such estimates are strongly related to individual methodological approaches. Standardizations of methods are needed with respect to monitoring programs in order to obtain directly comparable data from different environments. This discussion is also relevant to the problem of whether data of actual or potential measures of microbial activity should be used for long-term studies on remote ecosystems. (Auth.)

B-50661

Bölter, M., **Microcalorimetry and CO₂-evolution of soils and lichens from Antarctica**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.209-220, Refs. p.219-220.

Data on microcalorimetry and CO₂ evolution of soil samples and lichens from maritime and continental antarctic habitats were compared. Values from soil samples showed a strong relationship to the organic matter content. Microbial biomass estimates determined from conversion fac-

tors were compared with biomass estimates from epifluorescence microscopy. There are basic differences in the microbial biomass data among individual samples. They can be attributed to different physiological states of the microbial communities and their original habitats. Heat production correlated well with CO₂ evolution. (Auth. mod.)

B-50662

Kanda, H., Inoue, M., **Ecological monitoring of moss and lichen vegetation in the Syowa Station area, Antarctica**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.221-231, 23 refs.

Ecological monitoring of moss and lichen vegetation was carried out in the Yukidori Valley, Langhovde, East Antarctica. The valley area was approved as a Site of Special Scientific Interest (SSSI) in 1987. In addition to the two permanent photo points for lichens set up in 1975, all lichen species in 23 quadrats and moss species in 24 quadrats were determined and ecologically described. No increase of lichen growth was detected over periods of 5 and 14 years, and change in the moss vegetation is hardly detectable after three years. In the moss vegetation, the relations between the surface condition, epiphytic organisms like cyanobacteria and imperfect lichens, or sand cover, are discussed. Current abundance and spatial distribution of key species and environmental factors provide essential baseline data for long-term monitoring of local and global impacts on the non-marine biota of the Langhovde region. (Auth. mod.)

B-50663

Imura, S., Higuchi, M., Kanda, H., Iwatsuki, Z., **Structure of moss colonies in the Syowa Station area, Antarctica**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.232-236, 7 refs.

The morphological structure of colonies in vertical section was investigated for *Bryum argenteum*, *B. pseudotriquetrum* and *Ceratodon purpureus* in the Showa Station area. The colonies of these species were composed of two layers: the shoot layer containing green shoot tips and brownish shoots, and the rhizoid layer containing rhizoids and disrupted plant materials. The colonies of *B. argenteum* were shallower than those of other antarctic mosses, and also those of *B. argenteum* in Japan. The depths of the rhizoid layer of all three mosses were almost the same, but the shoot layer of *B. argenteum* in Antarctica was very shallow. In some cases, *B. argenteum* and *B. pseudotriquetrum* were found in the same colonies. Three structural patterns were recognized in the arrangement of two species in the same colonies. (Auth.)

B-50664

Naganobu, M., Hisanaga, M., Shimadzu, Y., **Vertical distributions of temperature, salinity and geostrophic flow along 45W in the southern ocean. (Extended abstract)**, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.293-296.

The fifth antarctic survey cruise of the *Kaiyo Maru* (Japan Fisheries Agency) was conducted in the waters from Drake Passage to the Scotia Sea in the southern ocean during the 1987/88 austral summer. Serial oceanographic observations were carried out along 45W from Dec. 24-29, 1987. Vertical distributions of temperature, salinity, density and geostrophic flow, almost to the sea bottom, from 50S to 62.3S near the pack-ice line along 45W were analyzed using the *Kaiyo Maru* data. Results are discussed and shown in a table and figures.

B-50669

Chown, S.L., Smith, V.R., **Climate change and the short-term impact of feral house mice at the Sub-antarctic Prince Edward Islands**, *Oecologia*, Dec. 1993, 96(4), p.508-516, Refs. p.515-516.

On Prince Edward Is., temperatures have increased by approximately 1°C over the past 40 years, accompanied by a decline in precipitation. The temperature- and moisture-sensitive sedge *Uncinia compacta* R.Br. (Cyperaceae) has consequently increased its aerial cover on Prince Edward Is., but harvesting of seeds by feral house mice (up to 100% removed) has prevented this from happening on Marion I. Scat analyses revealed that mice are not only eating ectemnorhine weevils to a greater extent than found in previous studies of populations at Marion I., but that they also prefer larger weevils (+/- 6 mm). A decrease in body size of pre-

ferred weevil prey species [*Bothrometopus randi* Jeannel and *Ectemnorhinus similis* C.O. Waterhouse (Coleoptera:Curculionidae)] has taken place on Marion I. (1986-1992), but not on the Prince Edward Is. Results not only provide support for previous hypotheses on the effect of global warming on mouse-plant-invertebrate interactions on the Prince Edward Is., but also provide limited evidence for the first recorded case of predator-mediated speciation. They also show that the interaction of human-induced changes operating at different scales may have profound consequences for local systems. (Auth. mod.)

B-50670

Verheyden, C., Jouventin, P., **Olfactory behavior of foraging procellariiforms**, *Auk*, Apr. 1994, 111(2), p.285-291, 28 refs.

Olfactory foraging, although very rare among birds, is frequently found in members of the Procellariiformes; this finding is based on a small number of field studies using a standardized method (i.e. raft tests). Reactions of 7 species previously tested under artificial conditions were tested again under natural feeding conditions (fish-oil slicks) to check validity. Concurrently, the authors compared the flight behavior of 2 groups of species (with and without olfactory capacities) when approaching an odor source. A large-scale experiment was then conducted in pelagic waters to test the reaction of a community of procellariiforms (15 species) to a food-related odor diffusing within a principal feeding area. The same reactions (attraction or indifference) to oil slicks as to test rafts in all species evaluated were observed. Results obtained with the standardized method thus hold under natural conditions. Some evidence was obtained that olfactory behavior may differ before and after locating odor sources, and also vary according to oceanic zones (coastal vs. pelagic). The authors discuss the hypothesis that certain species rely mainly on visual cues, recognizing and following species that are tracking food-related odors. (Auth. mod.)

B-50673

Bystrzejewska, G., Lukowski, A., Ligowski, R., **Changes in dynamics of ^{14}C incorporation and release by antarctic marine diatoms in the presence of Lindane during subsequent light/dark periods**, *Polish polar research*, Dec. 1993, 14(1), p.3-8, 6 refs.

The influence of lindane on net phytoplankton (mainly diatoms) in antarctic waters was investigated for 24 hours after the introduction of Γ HCH 0.02-2 ppm into the environment. Changes in intensity of ^{14}C incorporation in the light and in rate of release of ^{14}C by the cells in the dark during consecutive light/dark periods were measured. The effect of two different lindane concentrations in diatoms occurred 16 hours after introduction of the compound into the environment. The effect was manifested by delayed induction of photosynthesis following the dark period and also by changes in dynamic equilibrium between carbon assimilation and dissimilation. The presence of lindane clearly stimulated ^{14}C incorporation in the light and also enhanced the participation of ^{14}C incorporation in overall CO_2 exchange in the dark. (Auth.)

B-50674

Maciejewska, K., **Feeding of antarctic krill *Euphausia superba* in Weddell Sea**, *Polish polar research*, Dec. 1993, 14(1), p.43-54, Refs. p.52-54.

Phytoplankton is the main food component found in the stomachs of krill postlarval stages during summer. The diatoms *Thalassiosira*, *Nitzschia* and the tiny Pennatae constitute 98% of all consumed food particles (mean size: 21.4 microns). The average amount of algae found in the stomachs is about 1700 per individual. The difference in species composition and size of algae consumed by juvenile, pre-adult and adult individuals lessens food competition between particular age groups. (Auth. mod.)

B-50675

Bielecka, L., Żmijewska, M.I., **Chaetognatha of Drake Passage and Bransfield Strait (December 1983-January 1984, BIOMASS-SIBEX)**, *Polish polar research*, Dec. 1993, 14(1), p.65-74, 20 refs.

Materials used in this work were collected during the BIOMASS-SIBEX projects in Drake Passage and Bransfield Strait (1983-1984) in three water layers: 0-100, 100-300 and 300-500 m. Four species of Chaetognatha were found: *Eukrohnia hamata* and *Sagitta gazellae* in two water regions; *Sagitta planctonis* occurred mainly in the Drake Passage,

and *Sagitta marri* was noted in the Bransfield Strait and adjacent parts of the Bellingshausen and Scotia seas. Chaetognatha were most numerous in the Drake Passage, and generally in the 100-300 m water layer. Vertical distribution of Chaetognatha was clearly influenced by hydrological conditions. (Auth.)

B-50676

Lesinski, G., **Monitoring of birds and pinnipeds on King George Island (South Shetland Islands) in 1989/1990**, *Polish polar research*, Dec. 1993, 14(1), p.75-89, 17 refs.

In 1989-90, in the region of SSSI 8 situated on King George I., 21 bird species were observed; 12 species were breeding. Dominants were 3 *Pygoscelis* species (19,229 pairs). Five species of pinnipeds were observed. *Mirounga leonina* was most abundant in Jan. (623 individuals), *Arctocephalus gazella* in Feb. and Mar. (890 individuals), and *Hydrurga leptonyx* in Oct. (39 individuals). The abundance of *Leptonychotes weddelli* was low and rather stable. As a result of a mild winter during the study period, such birds as *Sterna vittata* and *Pygoscelis adeliae* stayed near their breeding places. The scarcity of *Lobodon carcinophagus* was probably also a result of the mild winter. (Auth.)

B-50677

Olech, M., Ligowski, R., **Polish Antarctic Bibliography: Botany (1972-1993)**, *Polish polar research*, Dec. 1993, 14(1), p.91-98.

This bibliography consists of original publications by Polish authors or co-authors concerning antarctic and subantarctic plants, including taxonomic, quantitative, biochemical and microbiological features, from research carried out between 1972 and 1993.

B-50684

Hochachka, P.W., Foreman, R.A., III, **Phocid and cetacean blueprints of muscle metabolism**, *Canadian journal of zoology*, Oct. 1993, 71(10), p.2089-2098, Refs. p.2097-2098.

Analysis of current knowledge of mammals indicates that enzyme adaptations in chronic hypobaric hypoxia are directed mainly towards up-regulation of metabolic efficiencies. Evidence that similar metabolic adjustments are utilized by seals was obtained by profiling the maximum enzyme activities of 4 phocid species (harbor seal, Weddell seal, crabeater seal, leopard seal) and one cetacean (fin whale). In the seals, the patterns obtained were strikingly similar to those of hypobaric hypoxia adaptations. The extensive enzyme data obtained on seals, however, showed notably different patterns from those found in whale muscles. The data from the large seals were consistent with the concept that low power output but high-efficiency metabolic functions of skeletal muscles coupled with inherently low (and potentially further suppressible) metabolic rates constitute strategic biochemical components in the design of a mesopelagic mammal. (Auth. mod.)

B-50685

Draggan, S., **Environment on rise as antarctic priority**, *Forum for applied research and public policy*, 1994, 9(1), p.89-92, 12 refs.

The U.S. Antarctic Program, as well as several other national research programs in Antarctica, have evolved from pioneer explorations and modest expeditionary forays. Today, the U.S. Antarctic Program, under the leadership of the National Science Foundation, is a complex operation with massive scientific infrastructures, including on-site laboratories and accommodations; fleets of aircraft, ships, and land vehicles, and massive communications and maintenance equipment. Its functions have expanded to include protection of Antarctica's nearly pristine environment; scientific research; and enhancement of the lives and health of the people who work there.

B-50701

Ray, M.K., Sitaramamma, T., Ghandhi, S., Shivaji, S., **Occurrence and expression of *cspA*, a cold shock gene, in antarctic psychrotrophic bacteria**, *FEMS microbiology letters*, Feb. 1, 1994, 116(1), p.55-60, 17 refs.

The homologue of cold shock gene *csp.4* of *Escherichia coli* was detected in various isolates of antarctic psychrotrophs representing both Gram-positive and Gram-negative bacteria. The Northern hybridization

study indicated that the transcript size of *cspA* in the psychrotrophic Gram-positive bacterium *Arthrobacter protophormiae* and Gram-negative *Pseudomonas fluorescens* was similar to that of *E. coli* and that the *cspA* homologues in these two psychrotrophs were expressed constitutively at a low level both at 4 C and 22 C. In *P. fluorescens*, the expression of *csp.4* mRNA was inducible after shift of temperature from 22 to 4 C and the maximum level of induction occurred after 1 h, which correlated with the time-lag required for growth of the culture after temperature shift. (Auth.)

B-50702

Guilizzoni, P., et al, **Preliminary results of limnological research in Terra Nova Bay area (Antarctica)**, *Documenta dell'Istituto Italiano di Idrobiologia*, 1992, No.32, p.107-120, 26 refs.

Data discussed in this paper come from samples collected in 4 areas during the austral summer season of 1988-89. Main morphometric parameters as well as locations of 34 small lakes are reported. The chemical data of lake waters and atmospheric deposition are discussed in term of nutrient concentration and salt content. The latter varies widely between lakes because of the different amounts of wind-borne sea-spray received and the various substrates in the watersheds. The nutrient content is low except in a few lakes receiving very high nitrates and basic cations, probably due to weathering. Due to the presence of thick ice cover on most of the lakes, only a few integrated samples for phytoplankton, zooplankton and benthos analyses were collected. In comparison to the benthic algae, the phytoplankton and zooplankton (mainly Rotatoria) are qualitatively (but non quantitatively) poor. (Auth.)

B-50706

Spaulding, S.A., McKnight, D.M., Smith, R.L., Dufford, R., **Phytoplankton population dynamics in perennially ice-covered Lake Fryxell, Antarctica**, *Journal of plankton research*, May 1994, 16(5), p.527-541, Refs. p.540-541.

Phytoplankton were collected over five austral summers (1987-88 through 1991-92) to examine seasonal and annual fluctuations in species composition and biovolume in Lake Fryxell, a perennially ice-covered lake with perennial gradients of salinity, dissolved oxygen and nutrients. It was found that algal species diversity was low (56 taxa were collected), confirming the results of previous short-term studies. The phytoplankton consisted primarily of cryptophyte and chlorophyte flagellates, and filamentous cyanobacteria. The presence of filamentous cyanobacteria, which have not been reported as abundant in this lake by previous workers, may represent a significant ecological change. Each austral summer, one dominant species contributed >70% of the total biovolume; *Chroomonas lacustris* was dominant in 1987-88, while *Cryptomonas* sp. dominated the phytoplankton in the succeeding 4 years. No species succession occurred during the austral summer. Some common taxa were vertically stratified (*Oscillatoria limnetica*, *Phormidium angustissimum*, *Pyramimonas* sp., *Oscillatoria* sp.), while others showed no distinct vertical stratification (*Chlamydomonas subcaudata*, *Cryptomonas* sp.). The stratification of the phytoplankton reflects the gradients of nutrients and light and the stability of the water column. (Auth.)

B-50715

Zdzitowiecki, K., **Antarctic acanthocephala**, Synopses of the antarctic benthos, Vol. 3, edited by J.W. Wägele and J. Sieg and Theses zoologicae, Vol. 15, edited by R. Fricke, Koenigstein, Germany, Koeltz Scientific Books, 1991, 116p., Refs. p.101-110.

DLC QL444.M34 Z38 1991

Following general remarks on the structure and biology of these antarctic parasites, collection, preparation, and preservation procedures are discussed. In the systematic part of the work, keys to the classes, orders, families, subfamilies, genera, and species of the Acanthocephalae found in antarctic waters are presented.

B-50721

Slattery, M., Bosch, I., **Mating behavior of a brooding antarctic asteroid, *Neosmilaster georgianus***, *Invertebrate reproduction and development*, 1993, 24(2), p.97-102, 32 refs.

Spawning behavior and male-female superposition of *Neosmilaster georgianus*, a common brooding asteroid, were observed both in the field and the laboratory at Palmer Station during the austral spring of 1991.

Pseudocopulation is preceded by exploration, contact, and mounting of a female by individual or multiple males. Male pre-mating activity in the field was initiated by the spawning of a nearby conspecific female. However, in laboratory experiments a similar pattern of activity was triggered by the presence of spawning conspecific males or male sea urchins, indicating that the presumed inductive signal lacks specificity. Pseudocopulation in this species may ensure maximal fertilization and enhance reproductive success. This is the first reported instance of aggregative spawning in an antarctic echinoderm. Moreover, pseudocopulation is a rare phenomenon among echinoderms worldwide and *N. georgianus* is only the third asteroid described to utilize this fertilization strategy. (Auth.)

B-50722

Mooi, R., David, B., **Ontogeny and origin of the brooding system in antarctic urechinid sea urchins (Echinodermata, Holasteroidea)**, *Zoomorphology*, 1993, Vol.113, p.69-78, 24 refs.

Echinoids usually broadcast gametes, and do not generally engage in a high degree of parental care. However, when they do, juveniles are typically maintained among the spines, or in shallow external depressions in the test itself. The brooding antarctic holasteroids *Urechinus mortenseni* and *Plexechinus nordenskjoldi* are bizarre exceptions: females develop an elaborate brooding system in which a small number of direct developing young are protected. Ontogeny of post-natal brooding urechinids is marked by profound divergence in the growth trajectories of male and female apical systems. In females this leads to dramatic departures from the patterns found in all other echinoids. Otherwise, coronal skeleton allometry of males and females is almost identical. Juveniles in brood pouches grow larger than the diameter of the apical aperture through which they must pass to reach the external environment. The apical plates, from which the brooding system is suspended, "hinge" downward to enlarge the aperture, allowing the young to emerge from the female. A possible origin for the brooding system suggests derivation by centripetal plate addition from the ocular plates in the coronal skeleton. A contrasting model is developed for the origin of the brooding system that relies on a proposed homology between genital and periproctal elements of the apical system of echinoids and the more highly developed dorsal skeleton of other echinoderm classes. (Auth.)

B-50723

Crescenti, N., Costanzo, G., Guglielmo, L., **Developmental stages of *Antarctomysis ohlinii* Hansen, 1908 (Mysidacea) in Terra Nova Bay, Ross Sea, Antarctica**, *Journal of crustacean biology*, May 1994, 14(2), p.383-395, Refs. p.394-395.

Detailed descriptions of 2 intramarsupial stages, the juvenile stages, and male and female immature stages in samples of *Antarctomysis ohlinii* Hansen, 1908, are given. Stage II shows an abundant yolk mass, 2 pairs of rudimentary antennae, and poorly developed mandibles. In stage III the yolk is absorbed and all the thoracic and abdominal appendages project freely. The juvenile stage starts when the larva leaves the marsupium. The antennulae, the antennae, and the mandibles assume the typical aspect of those of the adults. A statolith inside the statocyst appears in the endopod of the uropods. A morphological peculiarity of its immature stages (both in males and females) is described and referred to as sexual dimorphism. (Auth.)

B-50724

Mazzotta, A.S., Casaux, R.J., Marquez, M.E.I., **Seasonal changes in lipid content of some tissues in *Notothenia neglecta*, *Oebalia***, 1993, Vol.19, p.105-114, Refs. p.112-114.

Sixty-four *Notothenia neglecta* specimens were collected at Potter Cove from Mar. 1988 to Mar. 1989 to determine lipid content of the flesh, liver and gonad. The highest lipid levels were found in the liver and the lowest in the muscle. The species is classified as lean. In summer, mature specimens show an increase in the Condition Factor (K) as well as in the proportion of lipids in the muscle. In mature specimens, gonads reach the highest lipid percentage during autumn, just before spawning. The edible portion in relation to the total weight was 27.76% in males and 25.77% in females. The total lipid content of *N. neglecta* shows it to be a low-fat food resource, suitable for human consumption. (Auth. mod.)

B-50728

Osa, Y., et al, **Application of computed tomography to morphological study of Emperor and Adélie penguins**, *Auk*, July 1993, 110(3), p.651-653, 7 refs.

Computed tomography (CT) has been commonly applied to medical science and clinics. Using CT, the authors first attempted to measure the body and organ cross-sectional area of one male Emperor penguin; (the largest penguin) and one female Adélie penguin (a medium-sized penguin), which were initially collected for measuring heavy-metal concentrations. They calculated the body and organ volumes from the serial measurements of cross-sectional area as part of a morphological analysis of internal organ size. Preliminary results of the study are reported. The Emperor and Adélie penguins were collected on Riiser-Larsen Peninsula and Langhovde on Sep. 19, 1990 and Jan. 18, 1991, respectively. (Auth. mod.)

B-50735

D'Avino, R., et al, **Molecular characterization of the functionally distinct hemoglobins of the antarctic fish *Trematomus newnesi***, *Journal of biological chemistry*, April 1, 1994, 269(13), p.9675-9681, 32 refs.

Antarctic fish of the family Nototheniidae usually have a single major hemoglobin (Hb 1), often a second, minor component (Hb 2, about 5% of the total), and traces of another component (Hb C, less than 1%). These are functionally similar Bohr and Root effect hemoglobins. All species of other highly endemic fish families so far investigated also have one single major hemoglobin. The hematological features of the nototheniid *Trematomus newnesi* are remarkably different. It is the only antarctic species in which Hb 1 and Hb 2 display only very weak Bohr effect and no Root effect. Perhaps consequentially, Hb C (the only component showing regulation of oxygen binding by protons and other effectors) is not present in traces but accounts for 20-25% of the total. The primary structure of the three hemoglobins of *T. newnesi* and of Root effect Hb C present in trace amounts in another nototheniid (*Pagothenia bernacchii*) is discussed in relationship with oxygen binding and in terms of molecular and stereochemical models. The hemoglobin multiplicity, the oxygen binding features of Hb 1 and Hb 2, and the presence of functionally distinct components thus reveal that the oxygen transport of *T. newnesi* has unique characteristics. (Auth.)

B-50739

Coleman, C.O., **New *Epimeria* species (Crustacea: Amphipoda: Epimeriidae) and redescriptions of three other species in the genus from the antarctic ocean**, *Journal of natural history*, May-June 1994, 28(3), p.555-576, 24 refs.

Species of the genus *Epimeria* are one of the conspicuous groups of antarctic amphipods. Most of them are easy to distinguish by their characteristic dorsal outgrowths of the body. However, a rather small number of antarctic species of this genus have a smooth pereon, which makes identification more difficult. The new species *Epimeria annabellae* (Crustacea: Amphipoda: Epimeriidae) from the antarctic ocean is described. Additionally, redescriptions of the closely related *E. monodon*, *E. robusta* and *E. puncticulata* are given. (Auth. mod.)

B-50740

Rosso, A., **Bryozoa of the First Italian Antarctic Oceanographic Expedition (Terra Nova Bay, Ross Sea). I. Flustridae Smitt, 1867**, *Journal of natural history*, May-June 1994, 28(3), p.695-713, Refs. p.711-713.

An account is given of the species belonging to the bryozoan family Flustridae Smitt, 1867, collected during the First Italian Antarctic Oceanographic Expedition. A total of seven species pertaining to five genera have been determined: *Carbasea curva* (Kluge), *Flustra angusta* Kluge, *Flustra tenuis* Kluge, *Austroflustra vulgaris* (Kluge), *Klugeflustra drygalskii* (Kluge), *Klugeflustra vanhoeffeni* (Kluge) and *Nematoflustra flagellata* (Waters). (Auth.)

B-50741

Perry, N.B., et al, **Alkaloids from the antarctic sponge *Kirkpatrickia variolosa*. Part 1: variolin B, a new antitumor and antiviral compound**, *Tetrahedron*, March 28, 1994, 50(13),

p.3987-3992, 17 refs.

Variolin B (1), a new type of pyridopyrrolopyrimidine alkaloid with antitumor and antiviral properties, has been isolated from the antarctic sponge *Kirkpatrickia variolosa*, and its structure determined by X-ray crystallography. A degradation product, variolin D (2), has been identified from its spectroscopic data. (Auth.)

B-50742

Trimurtulu, G., et al, **Alkaloids from the antarctic sponge *Kirkpatrickia variolosa*. Part 2: variolin A and N(3')-methyl tetrahydrovariolin B**, *Tetrahedron*, March 28, 1994, 50(13), p.3993-4000, 10 refs.

Two pyridopyrrolopyrimidine alkaloids, variolin A (2) and N(3')-methyl tetrahydrovariolin B (3), have been isolated from the antarctic sponge *Kirkpatrickia variolosa*, and their structures determined by X-ray crystallography and interpretation of spectral data respectively. N(3')-methyl tetrahydrovariolin B (3) is moderately cytotoxic and showed antifungal activity, while variolin A (2) is weakly cytotoxic. (Auth.)

B-50743

Wharton, D.A., **Freezing avoidance in the eggs of the antarctic nematode *Panagrolaimus davidi***, *Fundamental and applied nematology*, May 1994, 17(3), p.239-243, 12 refs.

The eggshell of the antarctic nematode *Panagrolaimus davidi* protects the egg from exogenous ice nucleation and allows it to supercool in contact with external ice and be freeze avoiding. The proportion of eggs frozen by exogenous ice nucleation increases with decreasing nucleation temperature but this is unlikely to have a significant effect on survival in the field. Once the eggs have survived the initial freezing event there is little further risk of exogenous ice nucleation and the supercooled state is stable until the egg freezes at its supercooling point. (Auth.)

B-50744

Feller, G., et al, **Temperature dependence of growth, enzyme secretion and activity of psychrophilic antarctic bacteria**, *Applied microbiology and biotechnology*, June 1994, 41(4), p.477-479, 11 refs.

Five psychrophilic antarctic bacteria have been selected for their capacity to secrete exoenzymes into culture medium. These strains are able to grow from 0 to about 25 C. However, production of lipase from *Moraxella*, alpha-amylase from *Alteromonas haloplanctis*, B-lactamase from *Psychrobacter immobilis* and protease from *Bacillus* is maximal at temperatures close to that of their environment (-2 to 4 C) and is strongly inhibited at higher temperatures. This thermal effect involves alterations in the secretory pathway in the upper range of temperatures, losses due to the enzyme thermal lability and in some cases to reduction in cell development. The apparent optimal activity temperature of these enzymes is between 30 and 40 C, i.e. about 20 C lower than that of their mesophilic counterparts. (Auth.)

B-50745

Orecchia, P., et al, **Two new members in the *Contracaecum osculatum* complex (Nematoda, Ascaridoidea) from the Antarctic**, *International journal of parasitology*, May 1994, 24(3), p.367-377, 32 refs.

The genetic structure of adults and larvae of *Contracaecum osculatum* (*sensu lato*) from the Antarctic is analyzed on the basis of 24 enzyme loci. Significant deviations of genotype frequencies from the Hardy-Weinberg equilibrium were found, even in samples recovered from the same host. These data indicate that two distinct, reproductively isolated species coexist in *C. osculatum* (*sensu lato*) samples from the Antarctic. They were provisionally designated *C. osculatum* D and E, as they do not correspond to any of the 3 species previously detected in this complex from the Atlantic Arctic-Boreal region *C. osculatum* A, B and C). An allozyme diagnostic key for the identification of the 5 members of the *C. osculatum* complex, at the larval and adult stage and in both sexes, is given. Species D and E were found to be genetically quite variable. Both showed high values of intraspecific gene flow. *C. osculatum* evolutionary divergence took place during the Pleistocene, when this complex achieved a bipolar distribution. This process involved two distinct colonizations of the

marine antarctic region by ancestors of the Northern Hemisphere, about 1.5 and 1 m.y.a., giving origin to *C. osculatum* D and E respectively. (Auth. mod.)

B-50822

Dastych, H., **Some notes on antarctic mites (Acari)**, *Hamburg. Zoologisches Museum. Entomologische Mitteilungen*, Aug. 31, 1990, 10(139/140), p.43-56, 14 refs.

DLC QL461.H28

Four species of mites are reported from a site on the Antarctic Peninsula: *Alaskozetes antarcticus* (Michael, 1903), *Halozetes belgicae* (Michael, 1903), *Pretriophydeus tilbrooki* (Strandtmann, 1967) and *Tyrophagus* cf. *putrescentiae* (Schränk, 1781). Brief morphological remarks on particular species are presented. It is possible that the sample has been infested by *T. cf. putrescentiae* (Schränk). (Auth.)

B-50823

Dastych, H., Ryan, P.G., Watkins, B.P., **Notes on Tardigrada from western Dronning Maud Land (Antarctica) with description of two new species**, *Hamburg. Zoologisches Museum. Entomologische Mitteilungen*, Aug. 31, 1990, 10(139/140), p.57-66, 8 refs.

DLC QL461.H28

Two terrestrial tardigrades, *Diphascon sanae* sp. nov. and *Macrobiotus stuckenbergi* sp. nov. from lichens collected at nunataks in western Queen Maud Land are described. (Auth.)

B-50827

Bidigare, R.R., Ondrusek, M.E., Kang, S.H., **Measurements of photosynthetic and UVB blocker pigments during the Icecolors '90 expedition**, *Antarctic journal of the United States*, 1992, 27(5), p.119-120, 4 refs.

During austral spring 1990 a collaborative investigation (Icecolors '90) was undertaken to measure directly the effects of ozone diminution and ultraviolet (UV) radiation on southern ocean phytoplankton. This report summarizes the phytoplankton pigment measurements (photosynthetic and photoreprotective) and direct cell counts performed during Icecolors '90.

B-50828

Karentz, D., Bosch, I., Dunlap, W.C., **Distribution of UV-absorbing compounds in the antarctic limpet, *Nacella concinna***, *Antarctic journal of the United States*, 1992, 27(5), p.121-122, 8 refs.

Many antarctic species have some degree of natural biochemical protection from UV exposure. Over 85% of 60 marine species surveyed in 1988 contained mycosporine-like amino acids (MAA). MAAs are compounds which absorb UV radiation and may act as natural sunscreens, blocking UV rays before they reach critical target areas of cells and tissues. During spring 1991 a series of field and laboratory experiments was conducted on invertebrate and algal species at Palmer Station to investigate the physiological and ecological aspects of MAAs. The antarctic limpet *Nacella concinna* was included in this study. This species is dominant year-round in the Palmer Station area and is one of the few organisms present in the intertidal zone during early spring when the ozone depletion cycle begins.

B-50829

Neale, P.J., Lesser, M.P., Cullen, J.J., Goldstone, J., **Detecting UV-induced inhibition of photosynthesis in antarctic phytoplankton**, *Antarctic journal of the United States*, 1992, 27(5), p.122-124, 8 refs.

The relatively high intensities of middle ultraviolet radiation (UVB, 280 to 320 nm) during antarctic springtime ozone depletion can inhibit photosynthesis by antarctic phytoplankton. This was demonstrated by incubating phytoplankton for several hours in enclosures which transmit visible light but exclude different wavelengths of ultraviolet radiation. The authors' research focuses on the effect of UV on phytoplankton under natural conditions in the ocean, where vertical mixing can move phytoplankton through large gradients of damaging radiation over time scales ranging from minutes to hours.

B-50830

Smith, D.C., Steward, G.F., Azam, F., Hollibaugh, J.T., **Virus and bacteria abundances in the Drake Passage during January and August 1991**, *Antarctic journal of the United States*, 1992, 27(5), p.125-127, 10 refs.

High abundances of viruses have recently been discovered in various oceanic regimes and this has led to the suggestion that viruses may have a profound effect on food-web dynamics. If so, then current views on biogeochemical cycles in the ocean will need to be modified. Whether viruses are present in the southern ocean and, if so, whether they are as abundant as in other areas has not previously been addressed. The authors used transmission electron microscopy (TEM) to examine water samples from transects in both the winter and the summer in order to determine the spatial and temporal distribution of viruses in the southern ocean and their relationship to the distribution of bacteria.

B-50831

Hollibaugh, J.T., et al, **Measurement of bacterioplankton production in antarctic coastal waters: comparison of thymidine and L-leucine methods and verification of labeling patterns**, *Antarctic journal of the United States*, 1992, 27(5), p.127-128, 13 refs.

Bacterioplankton production in antarctic coastal waters was measured using the ^3H thymidine and ^3H -leucine methods. In view of the potential for metabolism of exogenous thymidine to complicate interpretation of incorporation data, the authors performed experiments to verify the expected macromolecular labeling patterns. The results of those experiments, and a comparison of bacterial carbon production estimates calculated from thymidine and L-leucine incorporation rates, are presented.

B-50832

McClintock, J.B., Slattery, M., Heine, J., Weston, J., **Chemical ecology of the antarctic spongivorous sea star *Perknaster fuscus***, *Antarctic journal of the United States*, 1992, 27(5), p.129-130, 12 refs.

In McMurdo Sound, *Perknaster fuscus* is common below the zone of ice scour and anchor ice (33 m), where it preys on sponges. *P. fuscus* consumes a variety of sponges, including *Tetilla leptoderma*, *Haliclona dancoi*, *Polymastia invaginata*, *Kirkpatrickia variolosa* and in particular the slimy sponge *Mycale acerata*. The feeding activities of *P. fuscus* complement those of another sea star (*Acodonaster conspicuus*) in regulating the abundance of *M. acerata*, a rapidly growing and potentially benthos-dominating sponge. Thus factors such as chemical defense, which may determine the abundance of *P. fuscus*, are important in indirectly mediating the structure of sponge populations. During the austral spring and summer of 1989, collections of *P. fuscus* were made to test the hypothesis that the body-wall tissues are chemically defended. Results suggest that a chemical irritant is present in the body wall and may also indicate that the body wall is noxious to potential predators.

B-50834

Pearse, V.B., Pearse, J.S., **Feeding rates of temperate and antarctic sea-star larvae: a viscosity effect?**, *Antarctic journal of the United States*, 1992, 27(5), p.132-133, 6 refs.

Larvae of temperate sea stars feed on microalgae at rates many times those of comparable antarctic species. In experiments with *Asterina miniata* from Monterey Bay, CA and *Odontaster validus* from McMurdo Sound using the same food concentration, the feeding rates of the temperate larvae were about 30 times those of the polar larvae. The viscosity of the seawater is the dominant factor determining the flow of the fluid, the movements of the food particles in it, and their interactions with the feeding larva. It is desirable therefore to separate the effects of temperature and viscosity on larval feeding. In the experiments described here, the authors attempted to do this by allowing larvae of *A. miniata* to feed at normal California sea temperatures in seawater of artificially elevated viscosity. Results suggest that viscosity alone could account for the feeding rate differences between antarctic and temperate seastar larvae.

B-50835

Browne, D.W., Berkman, P.A., **Epizooic foraminifera, tanaid, and polychaete species associations on antarctic scallop shells**,

Antarctic journal of the United States, 1992, 27(5), p.134-135, 10 refs.

During the 1986-87 austral summer, live scallops (*Adamussium colbecki*) were collected by scuba from Explorers Cove. This study provides a preliminary description of the interactions between epizooic species from three invertebrate phyla that co-occur on the same live animal habitat in an antarctic nearshore marine environment. Temporal variations within these epizooic assemblages are being analyzed in relation to the continuous growth of their substrates.

B-50837

Quetin, L.B., Ross, R.M., Frazer, T.K., Moylan, T., **Summary of WinCruise IV to the Antarctic Peninsula during September 1991**, *Antarctic journal of the United States*, 1992, 27(5), p.137-138, 4 refs.

The primary objective of WinCruise IV was to compare the physiology and abundance of larval krill collected from open water and from beneath sea ice to quantify the role of ice biota and recruitment of larval krill. The cruise dates were from Sep. 2 to Oct. 6, 1991. Stations were sampled along a transect line perpendicular to the pack ice edge northwest of Adelaide I. and proceeding from open water to a point as deep in the pack ice as possible. Water samples were collected at 15 stations for analysis of chlorophyll *a*, carbon to chlorophyll *a* ratios, and salinity. Ice algae samples were also collected for chlorophyll *a* determination. During the cruise, krill were found at every station except one. Juveniles and furcilia 6 were dominant, although a few furcilia 4 and 5 were collected. Preliminary analysis of 4 of the instantaneous growth rate experiments demonstrate that krill larvae and juveniles are growing rapidly in the spring, 7 to 14% of the total length per molt.

B-50838

Detrich, H.W., III, **Egg and brain tubulins from antarctic fishes are functionally distinct: support for the multitubulin hypothesis**, *Antarctic journal of the United States*, 1992, 27(5), p.139-140, 14 refs.

The functional and structural properties of tubulins purified from two distinct cell populations (eggs and neural tissues) of antarctic fishes were examined. In this report, the author reviews the evidence that demonstrates that brain and egg tubulins are functionally distinct *in vitro*, (and possibly *in vivo*), due to differences in isotypic composition, to differential posttranslational modification of shared isotypes, or to both.

B-50839

Ruzicka, J.J., **Otolith techniques to study age and growth of larval *Notothenia gibberifrons* and *Nototheniops larseni***, *Antarctic journal of the United States*, 1992, 27(5), p.140-142, 10 refs.

This research focuses upon the two development strategies of planktotrophic larvae: single-season and multi-season pelagic development. One species from both groups (each in the family Nototheniidae) has been selected and assumed to be typical of its group. *Notothenia gibberifrons* is a species with single-season (summer) pelagic development. *Nototheniops larseni* is a species with multi-season (over-winter) pelagic development. Samples of both species were collected from South Georgia and the western Bransfield Strait region on three different cruises. Description of the growth history of individual fish awaits an understanding of the relationship between fish size and otolith size over a range of sizes. When this is achieved, the description of growth and development rates through different seasons, stages of development, and between two different regions will be possible along with a better understanding of the two different life-history strategies.

B-50840

Janssen, J., **Responses of antarctic fishes to tactile stimuli**, *Antarctic journal of the United States*, 1992, 27(5), p.142-143, 5 refs.

Observations indicate that methods used by antarctic fishes to locate prey during the antarctic night are apparently diverse and contingent on the diet of the particular species. The eyes of the polychaete eaters are not well positioned for observing polychaetes, and it is likely that, even in lighted conditions, most polychaetes are detected by a combination of tac-

tile, hydromechanical, and probably chemical cues. A better understanding of the adaptiveness of the diverse behaviors will require a better understanding of habitats, winter diets, and predatory behavior.

B-50841

Crockett, E.L., Sidell, B.D., **Polyunsaturated fatty acids are metabolized by both mitochondrial and peroxisomal pathways of antarctic fishes**, *Antarctic journal of the United States*, 1992, 27(5), p.143-145, 8 refs.

The two most prevalent polyunsaturated fatty substrates in lipid stores of antarctic fishes, eicosapentaenoyl- (20:5) and docosahexaenoyl CoA (22:6), may be B-oxidized by either mitochondrial or peroxisomal compartment. These substrates may therefore be considered fuels for energy metabolism in *Gobionotothen gibberifrons*. Hepatic mitochondrial B-oxidation shows marked preference for the oxidation of a monounsaturate palmitoleoyl CoA (16:1) while peroxisomes can B-oxidize at comparable rates various fatty substrates which differ in chain length and degree of unsaturation. The rich polyunsaturated fatty acid (PUFA) endowments in fat stores of antarctic fishes thus appear to be a significant caloric resource for energy metabolism within this group.

B-50842

Chappell, M.A., Janes, D.N., Butcher, T.L., Shoemaker, V.H., **Reproductive effort, diving behavior, and foraging energetics in Adélie penguins**, *Antarctic journal of the United States*, 1992, 27(5), p.145-146, 2 refs.

Reproductive effort in Adélie penguins is examined, focusing on the field metabolic rates (FMR) and body composition, foraging behavior and diving physiology, and materials balance and growth efficiency of chicks. The authors established a study population of 170 banded breeding pairs during territoriality and courtship, and checked the status of each pair daily. In 7 colonies with 2,800 nests, the overall chick-rearing success rate was 1.30 chicks per nest, slightly higher than the average of 1.02 chicks per nest in 1990-91. The higher success rate in 1991-92 was probably due to greater krill availability. Field data on 110 marked Adélie chicks revealed large differences in growth rates and mass at the end of parental investment. Presumably these differences reflect variation in feeding rates and affect the probability of survival after fledging.

B-50843

Roby, D.D., Taylor, J.R.E., Place, A.R., **Investigations of the adaptive role of stomach oils in seabird reproduction**, *Antarctic journal of the United States*, 1992, 27(5), p.147-148, 7 refs.

The subjects of this study were antarctic prions, *Pachyptila desolata*, a species that feeds its young stomach oils, and South Georgia diving petrels, *Pelecanoides georgicus*, a species that lacks stomach oils. Chicks of the two species were crossfostered soon after hatching, and their growth, development, and rate of lipid deposition, as well as those of control chicks, were monitored throughout the nestling period. There were no detectable quantities of stomach oils in either control diving petrels or crossfostered prions. South Georgia diving petrels could not rear prion chicks, presumably because of the lack of stomach oils. Diving petrel chicks reared by prion foster parents grew at lower rates and fledged later than control diving petrel chicks. Diving petrels fed high-lipid diets in the lab lacked the ability to efficiently digest and to assimilate dietary lipids, and also excreted considerable lipid. The development of these chicks, measured as the rate of wing-length increase, was retarded, presumably due to excretion of essential nutrients along with excess lipid. Prion chicks fed a high-oil diet developed at the same rate as prion chicks on a low-lipid diet, but the rate of body mass increase was significantly higher.

B-50844

Miller, G.D., Wallace, G.E., Keimel, B.M., Martin, P., **South polar skuas at McMurdo Station, Ross Island, 1991-1992**, *Antarctic journal of the United States*, 1992, 27(5), p.148-150, 13 refs.

As part of a study on the south polar skua around Ross I. during the 1991-92 austral summer, the authors collected data on how skuas used McMurdo Station. They observed the skuas at McMurdo during the early season and at mid- and late-season to determine their reproductive success and what parts of the station attracted them the most. As part of the U.S. Antarctic Program's effort to improve the environmental impact of its

bases, the dump at McMurdo was cleaned, capped, and closed in 1991-92. The surveys were repeated on Dec. 22, 1991 (dump still available), and on Feb. 5, 1992, after the dump was completely capped, to track the local skua population as the season continued. The sudden loss of this resource in late 1991 may have had repercussions in the local and nearby skua populations. Given the number of skuas around the McMurdo dump in the early season each year, the dump probably was an important food source before Adélie penguins laid their eggs in nearby rookeries and while weather and ice conditions make foraging at sea difficult.

B-50845

Miller, G.D., **Reproductive success of south polar skuas at Cape Bird, Ross Island, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.150-151, 8 refs.

As in other populations, the natural variation in reproductive success (RS) of skuas is high. In seven seasons of monitoring at Cape Bird, skuas had their lowest RS in 1989 and their best year in 1991. In contrast to the skuas near Palmer Station, no years of complete reproductive failure have been recorded at Cape Bird. The relatively low RS in 1977 was due to storms during the breeding season, but none of the other years of low RS can be attributed to storms. Instead, the initial conditions of the rookery (i.e., conditions remaining from the winter) played a major role in the 1989 and 1990 seasons. In both of these seasons, snow covered many skua territories completely, and many eggs were lost early in the season because they were laid directly onto the snow. Hatching success of the eggs was generally low; it exceeded 50% in only one of seven seasons (1988).

B-50846

Schreer, J.F., Testa, J.W., **Population ecology of Weddell seals in McMurdo Sound, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.152, 7 refs.

During the 1991 austral summer season, Weddell seal ecology and behavior were studied at McMurdo Sound. Long-term studies of population dynamics, evaluation of alternate tagging methods, and blood analyses were conducted. A 3-year study of the use of satellite-linked time-depth recorders (SLTDRs) as a means of determining winter movements and diving behavior of adult females was concluded. During the 1991 overwinter season, all of the satellite-linked seals remained in Erebus Bay for most of Feb. and Mar. Movements out of the bay began in Apr. and by May, several seals were well north and northeast of Ross I. Two seals eventually traveled over 200 km northeast of McMurdo Sound to Pennell Bank. One of the seals was located in late July over 500 km from McMurdo Sound, near Coulman I. Winter dive depths obtained in this study indicate similar patterns to those seen in the summer.

B-50848

Kornicker, L.S., **Antarctic and subantarctic myodocopina (Ostrococha)**, Synopses of the antarctic benthos, Vol.5, edited by J.W. Wägle and J. Siegel and Theses zoologicae, Vol.22, edited by R. Fricke, Koenigstein, Germany, Koeltz Scientific Books, 1993, 185p., Refs. p.178-180.

DLC QL444.O85 K67 1993

About 15% of this work deals with preliminary data such as a chronological list of antarctic expeditions from 1851-1987 from which Myodocopina have been described; general anatomy and terminology; geographic distribution; biology and collection and preservation procedures. The remaining 85% provides a taxonomic description with drawings and keys of the species as they are organized into families and subfamilies. Most of these date from 1850 through 1896 to 1906 plus one family named by the author in 1970. An index is included.

B-50850

Berkman, P.A., **Epizoic zonation on growing scallop shells in McMurdo Sound, Antarctica**, *Journal of experimental marine biology and ecology*, June 15, 1994, 179(1), p.49-67, Refs. p.65-67.

Shells of living molluscs provide replicate natural substrata for interpreting the distributions, abundances and dynamics of fouling assemblages. Sessile epizoic species on growing antarctic scallop shells were analyzed in this study across a nearshore depth gradient from 0 to 30 m. Significantly lower epizoic biomasses were found at depths shallower than 20 m. Byssally-attached scallops less than 35 mm in shell height were not

found above 10 m. The proportions of epizoic annelida, chordata, cnidaria, and porifera also were significantly reduced above 10 m. The depth zonation of these epizoic species suggest that they were limited in shallow water by environmental factors such as siltation or geochemical changes associated with seasonal pulses of glacial meltwater. Between shell habitats, epizoic macrofaunal biomasses distinctly increased on scallops larger than 65 mm which were recessing into the sediment surface. Within these older shell habitats, arborescent epizoic demosponge aggregated in a zone near the peripheral margin of the shells and had an estimated growth rate on the shells of 60.8 mm/yr. Growth rate estimates are comparable to those determined by independent fouling experiments with inanimate substrates. The study demonstrates that epizoic assemblage variability can be interpreted between and within habitats on growing mollusc shells. (Auth. mod.)

B-50851

McClatchie, S., Greene, C.H., Macaulay, M.C., Sturley, D.R.M., **Spatial and temporal variability of antarctic krill: implications for stock assessment**, *ICES journal of marine science*, Feb. 1994, 51(1), p.11-18, 42 refs.

Acoustic estimates of antarctic krill biomass measured in four surveys around Elephant I. during the American Antarctic Marine Living Resources 1990 (AMLR90) cruises were analyzed. The depth-integrated biomass data were highly positively skewed; biomass frequency distributions diverged progressively over time; coefficients of variation over each survey indicated intense patchiness. It is concluded that sampling with resolutions finer than 100 m is necessary to determine the characteristic scales of spatial patchiness in krill distributions; and the application of biophysical data assimilation models would facilitate more accurate stock assessment of krill. Traditional survey methods could be improved by introducing long-range moored sonar arrays or towed bodies to operate in conjunction with ship surveys. Estimates are presented of the feasibility of detecting krill aggregations at up to 1-2 km range using a side-looking sonar operating at 20-40 kHz. (Auth. mod.)

B-50854

Balushkin, A.V., **Gvozdarus svetovidovi gen. et sp. n. (Pisces, Nototheniidae) from Ross Sea (Antarctica)**, *Journal of ichthyology*, June 1994, 34(1), p.152-158, For Russian original see 17B-39612. 6 refs.

A new nototheniid is described, *Gvozdarus svetovidovi* gen. et sp. n. holotype 533 mm TL, Ross Sea, 73.6S, 171E, depth 550 m. The new genus is referred to the subfamily Pleuragramminae and differs from other nototheniid genera in having a unique structure of the jaw teeth; the upper lip and snout are fused and the pelvic fins drastically reduced in size. (Auth.)

B-50856

Kolakowska, A., Kolakowski, E., Szczygielski, M., **Winter season krill (*Euphausia superba* D.) as a source of polyunsaturated fatty acids**, *Nahrung*, 1994, 38(2), p.128-134, 30 refs.

Krill caught in winter near South Georgia were examined as a raw intermediate product, precipitate and by-product. The following assays were performed: lipid composition (TLC), fatty acid composition (GC), lipid susceptibility to oxidation, and carotenoid content. Krill harvested in July/Aug. contained about 3% lipids. The amount of n-3 polyunsaturated fatty acids (PUFA: eicosapentaenoic and docosahexaenoic acids) in total lipids of whole krill accounts for 19.0% of fatty acids. There was no n-3 PUFA lost during the processes used to obtain the precipitate and the lipid formula. Krill is a valuable source of n-3 PUFA, primarily because of their stability in krill. (Auth. mod.)

B-50857

Karsten, U., et al, **Method for complete determination of dimethylsulphoniopropionate (DMSP) in marine macroalgae from different geographical regions**, *Phycologia*, May 1994, 33(3), p.171-176, 29 refs.

A simple method has been developed for better quantification of the dimethylsulphoniopropionate (DMSP) content in macroalgae as exemplified in *Acrosiphonia arcta* (Dillwyn) J. Agardh, *Desmarestia anceps* Montagne, *Enteromorpha bulbosa* (Suhr) Montagne, *Gigartina skottsbergii* Bory, *Halopitys incurvus* (Hudson) Batters, *Himantothallus grandifolius*

(A. et E.S. Gepp) Zinova, *Iridaea cordata* (Turner) Bory, *Palmaria decipiens* (Reinsch) Ricker, *Polysiphonia urceolata* (Lightfoot) Greville, *Polysiphonia pacifica* Hollenberg, *Polysiphonia paniculata* Montagne, and *Ulva lactuca* Linnaeus collected from different geographic regions. Four different methods for pretreatment of the algal samples were tested to improve breaking up cells and tissue. Oven-drying prior to preparation for gas-chromatographic analysis gave up to 682-fold higher DMSP concentrations compared to fresh material—the standard method. This points to an underestimation of many DMSP values published previously. Only *P. paniculata* exhibited higher DMSP concentrations after analysis of fresh material. Six of the named species were found at King George I. (Auth. mod.)

B-50858

Medlin, L.K., Lange, M., Baumann, M.E.M., **Genetic differentiation among three colony-forming species of *Phaeocystis*: further evidence for the phylogeny of the Prymnesiophyta**, *Phycologia*, May 1994, 33(3), p.199-212, Refs. p.209-212.

Sequence data from the 18S small subunit ribosomal RNA gene have been used to support the species status of three colony-forming species of *Phaeocystis* Lagerheim (Prymnesiophyta). Two of these correspond to *Phaeocystis globosa* Scherffel and *Phaeocystis pouchetti* (Hariot) Lagerheim. The third species originates from antarctic waters and is referred to *Phaeocystis antarctica*, described by Karsten at the turn of the century. Morphological and physiological data supporting the separation of the three species are compiled from the literature. Phylogenetic trees generated from the sequence data suggest that the warm-water species *P. globosa* diverged prior to the separation of the two cold-water forms. Tectonic events and climatic changes during the middle to late Cenozoic provide mechanisms by which speciation events could have occurred as both polar oceans were being formed. (Auth.)

B-50861

Cherel, Y., Charrassin, J.B., Challet, E., **Energy and protein requirements for molt in the king penguin *Aptenodytes patagonicus***, *American journal of physiology*, Apr. 1994, 266(4), p.R1182-R1188, 31 refs.

Adult king penguins annually fast ashore for 1 mo. for molting. By the end of molt, they have lost 44% of their prefasting body mass. About 18% of new feather synthesis occurs at sea, and continues during the first 3 wks of fasting. Loss of old feathers occurs between day 12 and day 21 of the molt, and it is associated with a peak in daily body mass loss. The dry mass of epidermal structure synthesized during molt is 395 g. Fat oxidation accounts for 85% of total energy expenditure. The proportion for protein is 15%, a value twofold higher than during the breeding (nonmolting) fast. The mean energy expenditure is also 21% higher during the molting fast. Compared with other birds, the energetic cost of feather synthesis is the lowest in king penguins (85 kJ/g) and consequently the energetic efficiency is the highest (25%). Integument is the main lipid source and thus the main source of energy. The integument and the pectoral muscles provide 20 and 57% respectively of the total protein needs for feather synthesis and/or energy expenditure. This result emphasizes the role of integument as a protein source. (Auth. mod.)

B-50862

Dumonteil, E., et al, **Dual core and shell temperature regulation during sea acclimatization in gentoo penguins (*Pygoscelis papua*)**, *American journal of physiology*, Apr. 1994, 26(4), R1319-R1326, 31 refs.

Penguins are able to maintain a high and constant body temperature despite a thermally constraining environment. Evidence for progressive adaptation to cold and marine life was sought by comparing body and peripheral skin temperatures, metabolic rate, and thermal insulation in juvenile and adult Gentoo penguins exposed to various ambient temperatures in air from -30 to +30 C and water 3-35 C. Juvenile penguins in air showed metabolic and insulative capacities comparable with those displayed by adults. Both had a lower critical temperature (LCT) close to 0 C. In both adults and juveniles, the intercept of the metabolic curve with the abscissa at zero metabolic rate was far below body temperature. This was accompanied by a decrease in thermal insulation below LCT, allowing the preservation of a threshold temperature in the shell. However, this shell temperature maintenance was progressively abandoned in immersed penguins as adaptation to marine life developed, probably because of its pro-

hibitive energy cost in water. Thus adaptation to cold air and to cold water does not rely on the same kind of reactions. Both of these strategies fail to follow the classical sequence linking metabolic and insulative reactions in the cold. (Auth.)

B-50863

Block, W., **Terrestrial ecosystems: Antarctica**, *Polar biology*, July 1994, 14(5), p.293-300, Refs. p.299-300.

Scientific reasons for the study of terrestrial ecosystems in the Antarctic are outlined together with brief descriptions of the maritime and continental zones. Opportunities for ecological research are high-lighted in terms of the terrestrial environments, biological colonization, organism survival and community development. Future research themes in terrestrial ecology are identified. (Auth.)

B-50864

Bonner, N., **Antarctic conservation and management**, *Polar biology*, July 1994, 14(5), p.301-305.

Activities of various Antarctic Treaty consultative meetings (ATCM), based on international scientific cooperation and concern for the preservation and conservation of natural resources in the Antarctic, are reviewed in the chronological order in which they developed, with comments on the resulting recommendations and adopted measures. The history, principles and effectiveness of such components of the Antarctic Treaty System as the CCAMLR, CRAMRA, and the Protocol on Environmental Protection are discussed, with the conclusion that increased effort will be required to keep Antarctica in its present nearly pristine state.

B-50865

Hureau, J.C., **Significance of fish in the marine antarctic ecosystems**, *Polar biology*, July 1994, 14(5), p.307-313, 35 refs.

A review is presented of the antarctic marine ecosystems, with a zoogeographical division of the southern ocean based on the distribution, origin and dispersal of coastal and demersal fishes. The definition of three main ecological zones is proposed, and their different pelagic and benthic feeding communities are described. It is concluded that fish play a central role in the foodweb and in the antarctic marine ecosystems, this role being comparable to that of krill. The key role of fish as prey for birds and squids and as predators of krill and other zooplankton is summarized in a figure.

B-50866

Le Maho, Y., **New perspectives for research on antarctic birds and mammals**, *Polar biology*, July 1994, 14(5), p.315-318, 30 refs.

New technology, based on miniaturization of electronic equipment and progress in computers, now enables one to get data on the foraging behavior of antarctic birds and mammals. This technical revolution is of major scientific importance because until recently it was considered impossible to study where animals feed and how much they consume. Feeding strategies may now be studied in relation to breeding status or availability in marine resources. This facilitates the use of antarctic animals as indicators of the changes in these resources. Automatic identification and weighing of breeding seabirds has also become possible. This means that changes in their body condition, e.g. body fuel reserves and food stores at sea, can be monitored. Thus a short-term indication of changes in the availability of some marine resources may now be obtained. These new methods represent a major advance because they open up new research possibilities, whereby antarctic animals can be monitored individually or at a population level, ashore or at sea, with minimal human disturbance. (Auth.)

B-50868

Whitehouse, M.J., Veit, R.R., **Distribution and abundance of seabirds and fur seals near the Antarctic Peninsula during the austral winter, 1986**, *Polar biology*, July 1994, 14(5), p.325-330, 16 refs.

Twenty-one species of seabirds plus fur seals were observed at sea near the Antarctic Peninsula between 60-68S in May and June 1986, a season for which few published observations of marine animals are available for this area. Here the authors describe and quantify the importance of fishing activities as well as sea-ice cover and other environmental variables to the distribution patterns of birds and seals. The most striking aspect of the

winter avifauna was its pronounced concentration near fishing trawlers operating on the continental shelf to the north and west of Elephant I., and its temporal shift in response to the seasonal advance of the ice edge. (Auth.)

B-50869

González, H.E., Kurbjeweit, F., Bathmann, U.V., **Occurrence of cyclopoid copepods and faecal material in the Halley Bay region, Antarctica, during January-February 1991**, *Polar biology*, July 1994, 14(5), p.331-342, Refs. p.340-342.

Faecal material and cyclopoid copepods were collected during the expedition ANT IX/3 in the Halley Bay area, between Jan. and Feb. 1991. Faecal material comprised pellets produced by krill, copepods, ostracods and appendicularians. Cyclopoid copepods were represented by two genera, *Oithona* and *Oncaea*. In the Halley Bay area, higher concentrations of krill faecal material and chlorophyll *a* were found within the upper 200 m of the water column of the polynya than in ice-covered open-ocean areas. Sedimented material collected at 50 m depth by a sediment trap was dominated by krill faecal strings. Contents of small oval pellets (of probable cyclopoid copepod origin) resemble those of krill faecal pellets, suggesting that coprophagy was involved. This suggestion is supported by the small quantity of food particles (other than krill faecal matter) available in the water column; the negative *in situ* correlation between krill faecal strings and cyclopoid copepods; and the structure of cyclopoid copepod buccal appendages, which are more adapted for raptorial feeding. (Auth. mod.)

B-50870

Brandt, A., Janssen, H.H., **Redescription of *Zonophryxus quinquedens* Barnard, 1913 (Crustacea, Isopoda, Dajidae) from the Weddell Sea, Antarctica, with notes on its biology and zoogeography**, *Polar biology*, July 1994, 14(5), p.343-350, 17 refs.

Until now the dajid isopod species *Zonophryxus quinquedens* Barnard, 1913 was only described from off Cape Point, South Africa. By collecting one male and three female specimens from the Weddell Sea, the known range of the species and genus has to be extended. One female specimen was found attached to the dorsal carapace of the benthopelagic decapod shrimp *Nematocarcinus longirostris* Bate, 1888, which served as a host for the ectoparasitic isopod. The mouthparts of the isopod penetrated directly into the heart of the shrimp. Based on new antarctic specimens and the type specimens of Barnard from the South African Museum, the authors present a redescription of *Z. quinquedens*. Possible conclusions from the disjunct distribution for the ecology of the species are discussed. (Auth.)

B-50910

Stampanato, S., Jangoux, M., **Echinodermata from Breid Bay (Princess Ragnhild Coast, Enderby Land, Antarctica) with the description of a new species of *Solaster*** [Les astérides (Echinodermata) de la Baie Breid (Côte de la Princesse Ragnhild, quartier Enderby, Antarctique), avec la description d'une nouvelle espèce de *Solaster*], *Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen. Biologie*, Dec.1993, Vol.63, p.175-184, In French with English summary. 17 refs.

Benthic surveys carried out from 1960-1967 in Breid Bay by Belgian scientific expeditions have yielded 28 species of asteroids. Among them one is new to science (*Solaster longoi* n.sp.) and five are new to the antarctic waters of the Enderby quadrant. (Auth.)

B-50911

Nordhausen, W., **Winter abundance and distribution of *Euphausia superba*, *E. crystallorophias* and *Thysanoessa macrura* in Gerlache Strait and Crystal Sound, Antarctica**, *Marine ecology progress series*, June 1994, 109(2/3), p.131-142, 68 refs.

Euphausia superba and *Thysanoessa macrura* were the two most abundant euphausiids in the ice-covered waters west of the Antarctic Peninsula during July and Aug. 1992. *E. crystallorophias* was limited to inshore waters. Detailed stratified sampling revealed that *E. superba* formed dense aggregations well below the ice, but did not inhabit the ice itself. In general, *E. superba* occupied the depth stratum from 15 to 130 m;

few or no other zooplankton were found within *E. superba* swarms. *T. macrura* displayed a depth preference for the strata from 90 to 250 m. Size-frequency distributions for *E. superba* and for *T. macrura* showed that larvae were absent and that both populations were dominated by small adults. A life cycle for *T. macrura* is proposed. (Auth.)

B-50912

Shilling, F.M., Bosch, I., **'Pre-feeding' embryos of antarctic and temperate echinoderms use dissolved organic material for growth and metabolic needs**, *Marine ecology progress series*, June 1994, 109(2/3), p.173-181, 52 refs.

The energy reserves of eggs of marine invertebrates have been assumed to supply the metabolic needs of development until feeding on particles commences. This view is challenged by recent laboratory studies which show that marine invertebrate embryos of some nonarthropodan phyla are able to transport and use dissolved organic material (DOM, e.g. amino acids and fatty acids) in seawater as a source of material (energy) for metabolic needs and growth. Here results are presented of experiments conducted *in situ* (in Antarctica and N. Pacific) and in the laboratory, which show that embryos could, in some cases, meet the metabolic costs of embryonic development and increase in organic weight (biomass) prior to being able to feed on particles. Increases in biomass of embryos of temperate species correlated with the timing of spring phytoplankton blooms. In contrast, the biomass of embryos (of temperate species) reared during periods of low primary productivity decreased, or remained constant. Phytoplankters exude DOM into seawater and these exudates are shown here to enhance embryonic growth. In most cases, there was no net use of endogenous reserves during prefeeding development; growth and energy needs were apparently met through consumption of DOM in seawater. It is suggested that DOM is an important food source for embryos of soft-bodied marine invertebrates in polar and temperate oceans. (Auth.)

B-50916

McMinn, A., Heljnis, H., Hodgson, D., **Minimal effects of UVB radiation on antarctic diatoms over the past 20 years**, *Nature*, Aug. 18, 1994, 370(6490), p.547-549, 18 refs.

It has been suggested that increased springtime UVB radiation caused by stratospheric ozone depletion is likely to reduce primary production and induce changes in the species composition of antarctic marine phytoplankton. Experiments conducted at Arthur Harbour in the Antarctic Peninsula revealed a reduction in primary productivity at both ambient and increased levels of UVB. Presented here are analyses of diatom assemblages from high-resolution stratigraphic sequences from anoxic basins in fjords of the Vestfold Hills. Compositional changes in the diatom component of the phytoplankton community over the past 20 years cannot be distinguished from long-term natural variability, although there is some indication of a decline in the production of some sea-ice diatoms. These results appear applicable to other antarctic coastal regions, where thick ice cover and the timing of the phytoplankton bloom protect the phytoplankton from the effects of increased UVB radiation. (Auth. mod.)

B-50946

Wang, T.C., et al, **Antifreeze glycoproteins from antarctic notothenioid fishes fail to protect the rat cardiac explant during hypothermic and freezing preservation**, *Cryobiology*, Apr. 1994, 31(2), p.185-192, 27 refs.

Antarctic notothenioid fishes avoid freezing through the action of circulating antifreeze glycoproteins (AFGPs). This study investigated whether AFGPs could serve as cryoprotectants for an isolated rat heart under three different storage conditions. (1) Hearts were flushed with 15 mg AFGP/ml cardioplegic solution (CP) and stored for 9 h at 0 C. This AFGP concentration has been reported to protect pig oocytes during hypothermic storage. (2) Hearts were flushed with 10 mg AFGP/ml CP-14 and stored frozen at -1.4 C for 3 h. At this concentration the AFGPs significantly reduce the solution freezing point and also change the crystal morphology from dendritic to spicular. (3) Hearts were flushed with 10 micrograms AFGP/ml CP-15 and stored frozen at -1.4 C for 5 h. At this low concentration the AFGPs have a strong effect on the crystal habit. Hearts frozen in the presence of high concentrations of AFGPs (10 mg/ml CP-14) failed to beat upon thawing and reperfusion, although their tissue ice content was less than that found in hearts without AFGP treatment. Hearts frozen with low concentrations of AFGPs showed reduced recovery upon thawing and reperfusion compared to CP-15 hearts, which recov-

ered to 67% of freshly perfused controls. Thus notothenioid fish AFGPs not only fail to enhance storage of the isolated rat heart preparation at hypothermic temperatures, but cause increased damage under freezing conditions regardless of AFGP concentration. (Auth. mod.)

B-50951

Nedwell, D.B., Rutter, M., **Influence of temperature on growth rate and competition between two psychrotolerant antarctic bacteria: low temperature diminishes affinity for substrate uptake**, *Applied and environmental microbiology*, June 1994, 60(6), p.1984-1992, 51 refs.

The growth kinetics of two psychrotolerant antarctic bacteria, *Hydrogenophaga pseudoflava* CR3/2/10 (2/10) and *Brevibacterium* sp. strain CR3/1/15 (1/15), were examined over a range of temperatures in both batch culture and glycerol-limited chemostat cultures. The maximum specific growth rate and Ks values for both bacteria were functions of temperature. The maximum specific growth rate values of both strains increased up to an optimum temperature, 24 C for 2/10 and 20 C for 1/15. For both bacteria, the specific affinity for glycerol uptake was lower at 2 than at 16 C. As the temperature increased from 2 to 16 C, the specific affinity of 1/15 for glycerol increased more rapidly than it did for 2/10. The steady-state growth kinetics of the two strains at 2 and 16 C imply that 1/15 would be able to outgrow 2/10 only at relatively low substrate concentrations and high temperatures, which suggests that 1/15 has a less psychrotolerant survival strategy than does 2/10. The data were compared with other data in the literature for bacteria growing at low temperatures. They also showed an increase of substrate-specific affinity with increasing temperature. These results explain recent reports of decreased affinity for substrates by heterotrophic bacteria in polar seas, with consequently increased difficulty of substrate uptake at low temperature, and may also be significant in explaining the limitation of primary production in the southern ocean. (Auth. mod.)

B-50952

Rutter, M., Nedwell, D.B., **Influence of changing temperature on growth rate and competition between two psychrotolerant antarctic bacteria: competition and survival in non-steady state temperature environments**, *Applied and environmental microbiology*, June 1994, 60(6), p.1993-2002, 42 refs.

Competition between two psychrotolerant bacteria was examined in glycerol-limited chemostat experiments subjected to non-steady-state conditions of temperature. One bacterium, a *Brevibacterium* sp. strain designated CR3/1/15, responded rapidly to temperature change, while a second, *Hydrogenophaga pseudoflava*, designated CR3/2/10, exhibited a lag in growth after a shift-down during a square-wave temperature cycle but not after a shift-up. The effects on competition and survival by these bacteria of both sine-wave and square-wave temperature changes between 2 and 16 C over a 24-h cycle time were examined, as well as square-wave cycles over 12 and 96 h. The changing proportion of each bacterium in the chemostat was determined by plate counting at regular intervals. Under a sine-wave temperature cycle *H. pseudoflava* outcompeted the *Brevibacterium* sp., but under square-wave temperature cycles the two bacteria coexisted because the lag by *H. pseudoflava* after the temperature shift-down favored the faster-responding *Brevibacterium* sp. The two bacteria thus exhibited different survival strategies, with *H. pseudoflava* adapted to effective competition under steady-state conditions and *Brevibacterium* sp. adapted to rapid adaptation and survival in a changing environment. (Auth. mod.)

B-50961

Wu, Q.Q., Wu, B.L., Chen, M., Huang, F.P., **Community analysis of shallow sea benthos in Great Wall Bay, Antarctica**, *Antarctic research*, June 1993, 4(1), p.42-49, 10 refs.

Data acquired at 19 quantitative dredging stations and 4 trawling stations during 3 cruises of the 4th Chinese Antarctic Research Expedition investigating the shallow sea benthos in Great Wall Bay from Dec. 1987 to Mar. 1988 are analyzed. Based on environmental characteristics, diversity of species composition and the evenness of interspecific distribution of individuals, cluster methods were used to divide the investigated area into 3 benthic community distribution areas. The structures of the various communities were further divided into 3 types: high diversity, intermediate diversity and low diversity. An extremely close relationship was found

between benthic community structure and the stability of bottom of the bay sediments, whereas in sea areas where the depth gradient is not significant, there is no obvious relationship between the structure of benthic communities and depth gradient. (Auth. mod.)

B-50962

Li, R.X., Yu, J.L., Lu, P.D., **Quantitative distribution of net phytoplankton in Great Wall Bay, Antarctica**, *Antarctic research*, June 1993, 4(1), p.50-54, For Chinese version see 20B-46891. 6 refs.

Among the 31 species of phytoplankton identified in Great Wall Bay in Feb. 1985, diatoms accounted for 93% (silicoflagellate and dinoflagellate). The dominant species found are *Chaetoceros socialis*, *Rhizosolenia alata* f. *inermis*, *Biddulphalus striata* and *R. styliformis* var. *longispina*. The quantitative distribution of *C. socialis* decreases from the interior of the Bay toward its entrance, the reverse being true for the other 3 species. The analysis of quantitative distribution shows a greater density of pelagic species at the entrance of the Bay, which is attributed to the influx of open oceanic waters into the Bay. It is found that the interior of the Bay is controlled by coastal waters. (Auth. mod.)

B-50963

Zhang, H.S., Pan, J.M., Cheng, X.H., Zhu, B.Y., **Biogeochemistry research of fluoride in antarctic ocean. 1. The study of fluoride anomaly in antarctic krill**, *Antarctic research*, June 1993, 4(1), p.55-61, For part 2 of this study see 20B-46892. 8 refs.

Studies show that the amount of fluoride in various parts of krill varies considerably. Most of the fluoride is concentrated in the carapace, up to 4028 microgram/g, and the head and legs, 2724 microgram/g and 2828 microgram/g respectively. The muscle contains the least fluoride at 226 microgram/g. The amount of fluoride in whole freeze-dried krill averages 1232 microgram/g, which indicates that the functional position of fluoride in krill is located mainly in the crust. Very little fluoride is found in the chitin of the carapace (200 microgram/g), which suggests that fluoride in the carapace exists mostly in the form of a nonchitinous constituent, closely related to other elements such as P and Ca. It is also proposed that a slightly higher concentration of fluoride in seawater and lower in sediments of the area studied, relative to other oceans is possibly affected by the concentration of fluoride in the huge store of krill in the area. The bioprocesses and precipitation with relation to the activity of krill should contribute significantly to the geochemical cycling of fluoride in the antarctic ocean. (Auth. mod.)

B-50964

Cheng, X.H., Wang, Y.H., Xia, W.P., Zhang, H.S., **Research on the benthic ecology environment, antarctic ocean: 1. Maxwell Bay and Admiralty Bay**, *Antarctic research*, June 1993, 4(1), p.62-70, For Chinese version see 21B-48118. 15 refs.

Data on benthic organisms and the geochemical environment of Maxwell and Admiralty bays show that benthic organisms grow well when the bottom water is rich in dissolved oxygen and oxidation is poor in surface sediments, with manganese oxides as dominant oxidant. In the low temperatures of the Antarctic, the solubility of carbonates is higher than that in other oceans, but the concentration of calcium in the overlying water and porewater is not, which may make it difficult for crustaceans and mollusks to obtain sufficient calcium to form their shells. A relationship between the amount of sedentary polychaetes and water temperatures is found, suggesting that the animals had not adjusted to the extremely cold antarctic waters.

B-50965

Helbling, E.W., **Factors affecting phytoplankton distribution and production in the Elephant Island area, Antarctica**, San Diego, University of California, 1993, 222p., University Microfilms order No. 94-02208, Ph.D. thesis. Refs. p.200-208.

During the austral summers of 1990 to 1993, intensive studies on phytoplankton were performed in the Elephant I. area, as one component of the U.S. Antarctic Marine Living Resources program. A frontal zone was usually found to the north of Elephant I. and over the continental slope, and high phytoplankton biomass was in general associated with this frontal region. There seems to be considerable year-to-year variability in physical (water temperature and salinity) and phytoplankton characteris-

tics within the study area, in regard to both distributional patterns in surface waters and to profile characteristics in the upper 100 m of the water column. The rate of photosynthesis in surface waters was inhibited by solar ultraviolet radiation, with approximately 50% of the inhibition due to UV-B (280-320 nm) and 50% due to UV-A (320-400 nm) radiation. However, phytoplankton (especially diatoms) in shallow upper mixed layers showed some degree of acclimatization by synthesis of UV-absorbing compounds. In general, diatoms dominated the crop in stations with shallow upper mixed layer and flagellates dominated in stations with deep mixed layers. There were some indications that UVR inhibited or affected nanoplankton size cells more than microplankton size cells. (Auth. mod.)

B-50969

Cabello, M.N., Gaspar, M.L., Pollero, R.J., *Glomus antarcticum* sp. nov., a vesicular-arbuscular mycorrhizal fungus from Antarctica, *Mycotaxon*, Apr.-June 1994, Vol.51, p.123-128, 12 refs.

An examination of soil samples collected on the rhizosphere of *Deschampsia antarctica* Dev. from Danco Coast for vesicular arbuscular mycorrhizal (VAM) fungi revealed an undescribed species of *Glomus* which forms sporocarps and abundant soil-borne and intradical spores in pot cultures, characterized by an evanescent outer wall, a laminated middle wall, and a membranous inner wall. (Auth.)

B-50970

Gaspar, M.L., Pollero, R.J., Cabello, M.N., *Glomus antarcticum*: the lipids and fatty composition, *Mycotaxon*, Apr.-June 1994, Vol.51, p.129-136, 13 refs.

Lipid and fatty acid composition were used as a biochemical character to distinguish *Glomus antarcticum* from other species of *Glomus*. Five species of *Glomus* are: *G. antarcticum* Cabello; *G. clarum* Nicolson and Schenck, *G. fasciculatum*, (Thaxter sensu Gerdemann) Gerdemann and Trappe, *G. mosseae* (Nicolson and Gerdemann) Gerdemann and Trappe, and *G. versiforme* (Karst) Berch. They were analyzed in order to distinguish each other in their lipid classes and fatty acid composition. This study revealed that *G. antarcticum* is clearly separate from the other species of *Glomus* analyzed here. (Auth.)

B-50971

Wu, B.L., Chen, M., Wu, Q.Q., Huang, F.P., Study on the quantity of shallow sea benthos in Great Wall Bay, Antarctica, *Antarctic research*, Dec. 1993, 4(2), p.1-10, 8 refs.

Based on the investigation material acquired during the 3 cruises of 4 Chinese antarctic research expeditions at 19 quantitative dredging stations and 4 trawling stations between Dec. 1987 and Mar. 1988, this paper studies the quantity of the benthos in Great Wall Bay, and the distributive characteristics and variations. The stock number of the benthos in the bay is extremely large, with two large-ranged high-mass areas and 2-3 small-ranged low-mass areas. The instability of the sediments is considered to be responsible for the low-mass areas. The warm season is the vigorous reproductive period for various kinds of benthos, and a monthly variation of the quantity is observed. (Auth.)

B-50972

Zhu, G.H., Analysis of the stomach contents of antarctic krill, *Euphausia superba* Dana, *Antarctic research*, Dec. 1993, 4(2), p.11-20, 17 refs.

Diet components of *Euphausia superba* of 12 sexual maturity stages from the adjacent waters off the South Shetland Is. were analyzed. The major points observed are summarized as follows: 135 taxa of nano- and microorganisms were found in krill stomachs, diatoms making up 60% of the species ingested. Planktonic nano- diatoms and nano-flagellates smaller than 20 microns in diameter accounted for 85% of the diet total. The dominant species in the stomach contents were *Nitzschia angulata* f. *minima*, *N. curta* f. *minima*, *N. curta*, and *Chrysostomum* sp. The mean cell number of these species was about 57 cells/ind. The stomach fullness increases gradually with the sexual maturity of the krill. (Auth.)

B-50975

Zhang, H.S., Pan, J.M., Cheng, X.H., Xia, W.P., Biogeochemistry research of fluoride in antarctic ocean. 2. The variation characteristics and concentration cause of fluoride in the cuticle of antarctic krill, *Antarctic research*, Dec. 1993, 4(2), p.36-41, 6

refs. For Chinese version see 20B-46892.

The cause of the concentration of fluoride in krill is studied by the analysis of fluoride change in krill cuticle before and after molting. Together with related information, the source and accumulating mechanism of fluoride in krill are also discussed. Results show that as an inorganic medium, the cuticle of krill has a secondary absorption function and action on fluoride after molting, which has nothing to do with the biological action of krill. Fluoride is concentrated from seawater, mainly in the form of ion exchange. (Auth.)

B-50978

Fanta, E., Meyer, A.A., Grötzner, S.R., Luvizotto, M.F., Comparative study on feeding strategy and activity patterns of two antarctic fish: *Trematomus newnesi* Boulenger, 1902 and *Gobionotothen gibberifrons* (Lönnberg, 1905) (Pisces, Nototheniidae) under different light conditions, *Antarctic record*, Mar. 1994, 38(1), p.13-29, With Japanese summary. Refs. p.28-29.

The behavior of *Trematomus newnesi* Boulenger, 1902 and *Gobionotothen gibberifrons* (Lönnberg, 1905), caught in Admiralty Bay during summer, is compared. Experiments were done at 2 C and two different light conditions. If both species are kept together in light for 24 hours, *G. gibberifrons* is usually more active than *T. newnesi*, but shows lower respiratory frequency. Compared to *G. gibberifrons* the feeding success is 15 times higher for *T. newnesi*; it seems to detect shapes and movements at longer distances, swimming directly toward the prey, ingesting and swallowing at once. *G. gibberifrons*, in the presence of *T. newnesi*, takes a long time to react to the food and catches it only at the bottom, swimming through short jumping movements. If not in the presence of *T. newnesi*, it may catch the prey near the surface, with slow movements, but in any case food must be tasted inside the mouth before it is accepted. *G. gibberifrons* has more taste buds in the upper lips and in the pharyngeal region of the branchial arches than *T. newnesi*. The eyes seem better developed in *T. newnesi*. (Auth. mod.)

B-50981

Okada, H., Kanda, H., Cytotaxonomical aspects of antarctic mosses, with special reference to the proportion of polyploidy, *Antarctic record*, Mar. 1994, 38(1), p.54-62, With Japanese summary. Refs. p.61-62.

The evolutionary tendency concerning karyological features, especially the proportion of polyploidy and infraspecific polyploidy in antarctic mosses, is reviewed. Almost all chromosome numbers reported from the Subantarctic and maritime Antarctic are within the world-wide range of deviation of ploidy proportions. The mosses at Yukidori Valley in the vicinity of Showa Station indicate an unusually high frequency of polyploidy, including infraspecific polyploidy, which is of particular interest in the understanding of the role of polyploidization in the harsh antarctic environment. (Auth.)

B-50985

Liang, Y.L., Cai, Q.H., Wang, J., Li, Z.S., Comprehensive environmental analyses and similarity of fresh water ecosystems around the Chinese Zhongshan Station, Antarctica, *Acta hydrobiologica sinica*, Mar. 1994, 18(1), p.92-94, In Chinese.

The ecosystems of 13 freshwater lakes in the Larsemann Hills around Zhongshan Station were studied in the summer of 1992-1992, with measurements of the following: water temperature; electrical conductivity; pH; bicarbonates in mg/l; total phosphorus in mg/l; phosphates in mg/l; total nitrogen in mg/l; ammonium nitrates in mg/l; silicates in mg/l; dissolved oxygen in mg/l; chlorophyll-*a* in micrograms/l; primary productivity in mgC/l/d; and community metabolism rate. A table is included showing the simple correlation and significant level of the observed factors. Two other tables show the multivariable regression and stepwise regression respectively for chlorophyll-*a* with selected nutrients.

B-50987

Schnack-Schiel, S.B., Mizdalski, E., Seasonal variations in distribution and population structure of *Microcalanus pygmaeus* and *Ctenocalanus citer* (Copepoda: Calanoida) in the eastern Weddell Sea, Antarctica, *Marine biology*, June 1994, 119(3), p.357-366, Refs. p.365-366.

The abundance, vertical distribution and population structure of two important small calanoid copepod species, *Microcalanus pygmaeus* (G.O. Sars) and *Ctenocalanus citer* Heron and Bowman, were studied in the eastern Weddell Sea in summer 1985, in late winter/early spring 1986 and in autumn 1992. The population of *M. pygmaeus* consisted mainly of copepodite stages CII and CIII in late winter/early spring and were concentrated between 500 and 200 m depth. In summer, stage CIV was the modal stage and the bulk of the population had ascended above 300 m. In autumn the population structure was bimodal with CI and CV dominating. Most of the population was concentrated between 300 and 200 m. In all investigation periods *M. pygmaeus* had their maximal concentrations in the thermo-pycnocline. The developmental stages CIII to CV of *C. citer* formed the bulk of the population in late winter/early spring. In Oct. all developmental stages had their main distribution between 500 and 200 m. In Nov. most of the population occurred between 200 and 50 m; the summer population was concentrated in the upper 50 m. Copepodite stages CII and CIII dominated the population at the end of Jan., while CIV dominated 2 wk. later. In autumn, CV was the modal stage. The majority of the population was concentrated in the upper 100 m, but there was an increase in abundance below 300 m compared to summer. The seasonal change in number of *M. pygmaeus* is much smaller than that of *C. citer*, the summer:winter:autumn ratio of the former being about one, whereas the winter:summer/autumn of the latter was about nine. (Auth. mod.)

B-50992

Harris, C.M., **Protected areas review: McMurdo Sound, Ross Sea**, *Polar record*, July 1994, 30(174), p.189-192, 11 refs.

As a result of new provisions in the Protocol on Environmental Protection to the Antarctic Treaty, a number of countries are reviewing the management plans for protected areas in Antarctica. The United States and New Zealand have initiated a review of the 15 existing sites in the Ross Sea region, using an independent party, the International Centre for Antarctic Information and Research, to facilitate and coordinate the process. Management provisions are being revised to comply with the Protocol, and improved maps for the sites are being prepared using Geographical Information Systems. Visits in 1993-94 gathered field information, and thus far two sites have had new plans drafted; these are proceeding through the international review process. Input and comment is invited from interested parties with experience in these areas. (Auth.)

B-50994

Scott, J.J., Kirkpatrick, J.B., **Effects of human trampling on the sub-Antarctic vegetation of Macquarie Island**, *Polar record*, July 1994, 30(174), p.207-220, Refs. p.219-220.

The effects of trampling on six types of vegetation and their underlying soils were investigated on Macquarie I. One hundred fifty foot-passes per year for at least the past 10 years have occurred on a typical 6 km stretch of walking track on the island's upland plateau. Trampling favors vascular plants including exotics, especially *Poa annua*, while bryophytes and lichens are more common in undisturbed vegetation. The abundance of 19 of the 39 most common species appears to be affected by trampling. Track width is positively correlated with exposure and wet soils, and trampling increases the soil bulk density of the track. The contrast between the soil bulk density of the trampled and untrampled soils increases with increasing exposure. While present environmental damage is within an acceptable range over the majority of the island, the extreme environments are likely to suffer unacceptable levels of damage if increased usage occurs with more tourism or expansion of scientific and related activities. This is demonstrated by the diversion of a short section of plateau track in an atypically heavily used area; the diversion sustained substantial damage after 890 foot-passes during a 15-month period. (Auth.)

B-50996

Bryden, M.M., **Marine mammals and conservation in the antarctic marine system**, *Australian zoologist*, Aug. 1993, 29(1-2), p.63-76, 14 refs.

A report is presented based on the growing concern for the decline in numbers of antarctic living resources, especially seals and the great whales. The food web in the antarctic marine ecosystem is discussed and illustrated, including a review of marine mammalian predators of krill and the importance of the latter in the antarctic food chain. Some proposals on how to prevent further food-related damage are reviewed.

B-50997

Smith, R.I.L., Øvstedal, D.O., ***Solorina spongiosa* in Antarctica: an extremely disjunct bipolar lichen**, *Lichenologist*, 1994, 26(2), p.209-213, 8 refs.

The bipolar foliose lichen *Solorina spongiosa* (Sm.) Anzi is reported from James Ross I. where it grows on moss. This is only the third known occurrence of this lichen from the Southern Hemisphere, the other localities being in Tierra del Fuego and New Zealand. Its morphology resembles that of the New Zealand population and arctic-alpine populations from the Northern Hemisphere, although there are some differences in apothecial and spore size. As elsewhere, it occupies base-rich habitats colonized by predominantly calcicolous mosses and lichens. (Auth. mod.)

B-50999

Van Heezik, Y.M., Seddon, P.J., Cooper, J., Plös, A.L., **Interrelationships between breeding frequency, timing and outcome in King Penguins *Aptenodytes patagonicus*: are King Penguins biennial breeders**, *Ibis*, July 1994, 136(3), p.279-284, 22 refs.

King Penguin chick growth is interrupted by a winter fast which extends the length of the breeding cycle to 14-16 months, so that continuous annual successful breeding appears to be impossible. The 3-month laying period imposes further constraints with respect to timing of breeding attempts in relation to the onset of fasting. By the frequent resighting of individually marked birds at Marion I., the frequency of breeding and the relationships among timing, outcome and frequency in the same and in consecutive years were examined. A total of 3,101 adult King Penguins were banded between 1984 and 1991, yielding continuous breeding histories spanning a maximum of 5 years. Most penguins attempted to breed in consecutive years, although the likelihood of taking a year off increased with the number of consecutive attempts. In any one season, about 19% of potentially breeding adults did not breed. Early breeders were more likely to succeed than late breeders and comprised 84% of breeding attempts of known timing. Successful birds in one season usually bred late in the following season, whereas failed attempts were usually followed by an early attempt. Non-breeding was more likely to occur after a successful outcome than a failed one, and after a year off, 93% of birds bred early. It is therefore incorrect to refer to the King Penguin as a biennial breeder. (Auth.)

B-51000

Chaurand, T., Weimerskirch, H., **Incubation routine, body mass regulation and egg neglect in the Blue Petrel *Halobaena caerulea***, *Ibis*, July 1994, 136(3), p.285-290, 25 refs.

In Blue Petrels the body mass at the start of an incubation shift, and also when the bird was relieved, varied throughout the incubation period, whereas the mass when birds deserted the nest was stable. Birds deserted the nest when their mass decreased to threshold, independent of the duration of the fast. Temporary egg neglect was observed in successful as well as in unsuccessful breeding attempts, but it increased the risk of breeding failure. The net and daily mass gained at sea during the second part of the incubation period were higher than during the first part, suggesting an increase in food availability. During the first part, the mass gained at sea and time spent foraging were inversely related to the mass of the bird before it left the burrow, whereas a similar relationship did not occur thereafter. The results suggest the occurrence of a fixed mass threshold when birds decide to leave the nest if not relieved by their partner. The mass when a bird left its nest influenced the time spent foraging or mass gained when food was scarce. Although decision rules to leave the nest or return from the sea are related to body condition, the possibility of neglecting the eggs temporarily enables Blue Petrels to regulate the trade-off between risks of breeding failure and risks of an increase in adult mortality. A model for behavioral decision to stop incubating or stop feeding, based on a variable set point, is proposed. (Auth. mod.)

B-51011

Wang, Z.P., **Growth of chick in the south polar skua and some factors influencing it near the Zhongshan Station, East Antarctica**, *Antarctic research (Chinese edition)*, Mar. 1994, 6(1), p.25-34, In Chinese with English summary. 14 refs.

The growth of chicks of the south polar skua near Zhongshan Station was observed in 1989-1990 austral summer. The breeding period lasted from mid-Dec. to mid-Feb. The survival rate of chicks was very low at

38.9%. During 53.2 days (range 52-55 days) of breeding, the chicks grew at average daily rate of 27.42 g/d and 16.56 g/d (first and second chicks, respectively). The logistic curve was fitted to the weight data for typical growth. The important factors influencing chick growth and mortality are discussed, including food, unfavorable weather and predation by adult skuas. (Auth. mod.)

B-51012

Wu, Y.L., Chen, B., **Scanning electron microscopic analysis on egg shell of Adélie penguin, *Pygoscelis adeliae*, Antarctic research (Chinese edition)**, Mar. 1994, 6(1), p.35-39, In Chinese with English summary. 3 refs.

An analysis is made of the fine structure and element composition of the Adélie penguin egg shell by SEM and EDX. The results show that the outer and inner surfaces of the shell are irregular platelet-like cortex and compactly reticulated fibriform endomembrane, respectively. There are three-layer structures, in which the texture and composition show distinct differences between the outer cortex and the endomembrane. Among them, the outer- and mid-layer are mainly composed of calcium carbonate and a small amount of calcium phosphate. The content of calcium and phosphorus is Ca: 95.81% and 97.81%, P: 4.19% and 1.87%. SEM observations reveal that the calcium carbonate calcite-layer structure in the outer layer is similar to that in the egg shell of other birds or reptiles. However, the main component of the inner layer in the Adélie egg shell, which is greatly different from the egg shell of other birds or reptiles, is calcium sulphate, containing up to 84.26% sulphur. (Auth.)

B-51016

Cunningham, D.M., Moors, P.J., **Decline of Rockhopper penguins *Eudyptes chrysocome* at Campbell Island, southern ocean and the influence of rising sea temperatures**, *Emu*, Mar. 1994, 94(Part 1), p.27-36, 34 refs.

Rockhopper penguin numbers at Campbell I. have declined by 94% since the early 1940s. Many breeding colonies have disappeared and the remaining nine major colonies have all shrunk in size. It is estimated there were 103,000 breeding Rockhopper penguins in 1985, compared with approximately 1.6 million in 1942. The decline had started by 1945, was greatest during the next 10 years and coincided with substantial changes in sea temperatures. The mean Dec.-Feb. seasurface temperature rose from 9.1 C in 1944 to peaks of 9.7 C in 1948-49 and 9.6 C in 1953-54. It declined to 8.6 C by 1965, rose rapidly to 10.2 C by 1970, and has averaged 9.7 C since then. In one colony, Rockhopper penguin numbers temporarily increased after the cooler seas of the 1960s. The authors conclude that rising sea temperatures are associated with the decline, which may have been caused by changes in the penguins' food supply; there is no evidence that terrestrial factors have been responsible. (Auth.)

B-51017

Holm-Hansen, O., Huntley, M.E., **Research on Antarctic Coastal Ecosystem Rates (RACER): 1991-1992 field season**, *Antarctic journal of the United States*, 1992, 27(5), p.153-154, 7 refs.

The basic objective of RACER field work was to design a sampling protocol which would permit interpretation of biological and chemical data in regard to both spatial (including depth) and temporal considerations, and to better understand the interactions among physical, optical, and chemical factors on the biota. The major objectives of the field program during the 1991-1992 field season were to study the factors involved in the demise of the phytoplankton bloom and the resulting effects on other microbial and zooplankton assemblages. Two cruises were completed this field year; one summer cruise during Dec. to Jan., and one mid-winter cruise during July and Aug. As previous studies had shown that phytoplankton concentrations were very patchy in Gerlache Strait and apparently were related to a complex and dynamic water flow pattern through the study area, some changes were incorporated to the work during the summer cruise and are discussed.

B-51018

Holm-Hansen, O., Vernet, M., **RACER: Distribution, abundance, and productivity of phytoplankton in Gerlache Strait during austral summer**, *Antarctic journal of the United States*, 1992, 27(5), p.154-156, 7 refs.

The objectives for the work described in this report were to determine the distribution and abundance of phytoplankton in the water column (0 to 750 m) in the Gerlache Strait area, and find how these distributions changed during the period of the cruise; to support the airborne sensor measurements with ground truth data for photosynthetic pigments; to measure the rate of primary production; and to better understand the factors responsible for the great variations in phytoplankton concentrations normally encountered in these waters, in regard to both spatial and temporal factors. The field work consisted of three four-day periods of intensive process-oriented studies at station A, alternating with three four-day 'fast-grids' in which profiling studies were done at 44 stations.

B-51019

Vernet, M., **RACER: Predominance of cryptomonads and diatoms in the Gerlache Strait**, *Antarctic journal of the United States*, 1992, 27(5), p.157-158, 4 refs.

High-chlorophyll concentrations characterize waters of the Gerlache and Bransfield straits in spring and summer in what seem to be recurrent blooms. Diatoms and prymnesiophytes are well-known components of these coastal blooms. Recently it has been suggested that a prasinophyte such as *Pyramimonas* was an abundant component of the nanoplankton fraction during the bloom of 1986-1987 in this area. In this paper the author reports a widespread distribution of cryptomonads in addition to diatoms in Dec. 1991, in areas where pigment concentration in the mixed layer reached up to 10 mg chlorophyll *a* per cubic meter.

B-51020

Ferrario, M.E., Sar, E., **RACER: Phytoplankton populations in the Gerlache Strait**, *Antarctic journal of the United States*, 1992, 27(5), p.158-159, 18 refs.

The research reported here was designed to address the following objectives: analyze the structure of the phytoplankton population; establish the quantitative and qualitative species composition of the phytoplankton; determine at which period of the bloom and under which environmental conditions resting-spores develop; and establish the utility of diatoms found in the area of the Gerlache Strait as tracers of water masses. Samples from the water column and surface water were taken on board the R/V *Polar Duke* from Dec. 9, 1991 to Jan. 3, 1992.

B-51021

Brody, E., Mitchell, B.G., Holm-Hansen, O., Vernet, M., **Species-dependent variations of the absorption coefficient in the Gerlache Strait**, *Antarctic journal of the United States*, 1992, 27(5), p.160-162, 19 refs.

In 1992, during the Research on Antarctic Ecosystem Rates 3 (RACER3) cruise in the Antarctic, over 163 absorption spectra were collected at various stations and depths in Gerlache Strait and near the ice edge. This data set is used to demonstrate the role of species differences as a source of variation in pigment-specific absorption coefficients.

B-51024

Tien, G., et al, **Seasonal variability in microbial biomass in the Gerlache Strait: a feast-or-famine existence**, *Antarctic journal of the United States*, 1992, 27(5), p.166-167, 9 refs.

During the RACER4 expedition (July and Aug. 1992), the authors returned to a region of the Antarctic Peninsula where they previously had measured summer microbial biomasses that were among the highest ever reported for the neritic portion of the world ocean. The following initial results, reported underway from the R/V *Nathaniel B. Palmer* in Gerlache Strait, indicate that microbial biomasses in this same region during winter-time are among the lowest ever reported from the surface ocean. It is suggested that this remarkable contrast between summer and winter conditions must have a major influence on the structure and function of the microbial food web, and on physiological and metabolic strategies of survival during the periods of extreme oligotrophy. This example of a feast-or-famine existence for the microbial assemblages of Gerlache Strait emphasizes the importance of year-round investigations of the antarctic marine ecosystem in order to understand adequately carbon and bioelement cycling, especially the inception and demise of the annual spring bloom.

B-51025

Szyper, J.P., Karl, D.M., **RACER: Sinking rates and vertical flux of phytoplankton pigments**, *Antarctic journal of the United States*, 1992, 27(5), p.168-170, 12 refs.

Sinking and material flux rates are estimated by two basic strategies. The trap method integrates processes over depth and time, while SETCOL analyses are closer to "point" estimates from discrete depths during short periods (2 to 6 hours). The authors employed both methods at a station in the northern Gerlache Strait during the RACER3 cruise in Dec. 1991. Sinking and flux rates are analyzed here in terms of chlorophyll *a* and phaeopigments that were determined fluorometrically aboard ship. The influence of pellets on flux rates is illustrated by the discrepancy between the phaeopigment contribution to the SETCOL rate at 75 m (which has no fecal pellet component) and to the MULTITRAP rate at 80 m on the same date. The two methods address the same natural process, but the characteristic exclusion of large particles from SETCOL experiments can be exploited to quantify the separate contribution of such particles to total vertical flux.

B-51026

Christian, J.R., Karl, D.M., **Exocellular enzyme activities in Gerlache Strait, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.170-171, 3 refs.

During the 1991-1992 austral summer RACER cruise, activities of bacterial exocellular enzymes beta-glucosidase (BGase) and leucine aminopeptidase (LAPase) were measured in the Gerlache Strait. Two fast grids (30 to 40 stations sampled over approximately 72 hours) of surface water samples were taken, and four depth profiles (0 to 200 m) at station A. The activities of these enzymes are found to be extremely patchy in time and space. Four occupations of station A at intervals of 5 to 7 days show that these enzymes are part of a highly dynamic system. On Dec. 19 a large peak in the activities of both enzymes was observed at 50 m, which was not present on Dec. 12. A trace of this peak remained on Dec. 25 but had disappeared at less than 20 m. This pattern is the same for both enzymes, although the overall correlation between the two over all four profiles is weak.

B-51027

Huntley, M.E., Kaupp, S., Lopez, M.D.G., **RACER: Vertical migration and bioenergetics of *Metridia gerlachei* during spring 1991-1992**, *Antarctic journal of the United States*, 1992, 27(5), p.172-173, 7 refs.

This report is on the herbivorous feeding and diel vertical-migration cycles of *Metridia gerlachei* in the Gerlache Strait. The research was conducted as part of the RACER program, designed to study ecosystem dynamics during the spring bloom. Photosynthetically active radiation and the vertical distribution of chlorophyll *a* were also measured during the same period. In late Dec., females dominated the population of *M. gerlachei*. These exhibited pronounced diel vertical-migration behavior, which imposed a similar rhythm on herbivorous grazing. The population was essentially absent from the surface during daylight hours, most of it being concentrated well below 200 m (bottom depth at station A is approximately 325 m). Abundance at the depths where the female population was centered was usually in the range of 25 to 100 individuals/cu m.

B-51028

Loeb, V.J., **RACER: Composition and vertical distribution of larval fishes at a time-series station in Gerlache Strait, November 1989**, *Antarctic journal of the United States*, 1992, 27(5), p.173-175, 6 refs.

Among objectives of the 1989 RACER Program were studies to determine whether the relatively high zooplankton abundance in Gerlache Strait is due to accumulation from physical processes or whether it originates there through high rates of local reproduction, development, and survival. To address this question, an intensive program of vertically and horizontally stratified zooplankton sampling was undertaken by using a multiple-opening-closing-net-and-environmental-sensing system (MOCNESS) at grid stations within Gerlache Strait and southwest Bransfield Strait and at a time-series station (station A) located in the eastern Gerlache Strait. About 1,200 MOCNESS samples were collected and are being analyzed to provide information on the early life stages of fish in

addition to the dominant euphausiid and copepod species. Presented here are the preliminary results from analysis of the fish collected during the time-series sampling at station A.

B-51029

Karl, D.M., et al, **RACER: The Marguerite Bay ice-edge reconnaissance**, *Antarctic journal of the United States*, 1992, 27(5), p.175-177, 10 refs.

To date, the RACER program productivity hypotheses have been tested in the generally ice-free areas of Gerlache Strait. However, during the 1991-1992 austral summer, the measurements were extended south along the west coast of the Antarctic Peninsula and into the marginal ice-edge zone of Marguerite Bay. This brief report provides an overview of the Marguerite Bay reconnaissance, including station locations, sampling strategies, and hydrographic setting. It also presents preliminary evidence for an extensive nutrient-limited phytoplankton bloom in the meltwater-stratified portion of the ice-edge zone.

B-51031

Zhou, M., Nordhausen, W., Huntley, M.E., **RACER: Small-scale distribution of *Euphausia superba* in winter measured by acoustic Doppler current profiler**, *Antarctic journal of the United States*, 1992, 27(5), p.179-181, 8 refs.

One of the principal goals of the 1992 RACER expedition was to investigate the distribution of *Euphausia superba* in ice-covered seas in waters west of the Antarctic Peninsula. The two instruments used to make such observations were a Multiple Opening Closing Net and Environmental Sampling System (MOCNESS) and a 150 kHz acoustic Doppler current profiler. Results show that the occurrence of *E. superba* in the upper water column during winter appears to be ubiquitous. No evidence was found of association with the immediate under-ice environment or of phytoplanktivory. The vertical distribution during winter appears to be strongly related to the purely carnivorous feeding habits of *E. superba* in winter.

B-51032

Nordhausen, W., Huntley, M., Lopez, M.D.G., **RACER: Carnivory by *Euphausia superba* during the antarctic winter**, *Antarctic journal of the United States*, 1992, 27(5), p.181-183, 17 refs.

This study was part of the RACER IV winter expedition to the coastal region of the Antarctic Peninsula that was conducted from July 14 to Aug. 12, 1992. The field program encompassed fast grid stations of previous RACER cruises in the Gerlache Strait and additional stations in the Grandier Channel and as far south as the coastal waters of Adelaide I. Data indicate that *Euphausia superba* could not have conceivably maintained their observed excretion rates on a diet of phytoplankton or bacteria. The observations of gut content, predation rates, and vertical distribution strongly imply that only zooplankton could have provided adequate food for their survival through the winter.

B-51033

Huntley, M.E., et al, **RACER: Ammonia excretion rates of antarctic zooplankton in winter, with emphasis on *Euphausia superba***, *Antarctic journal of the United States*, 1992, 27(5), p.183-185, 11 refs.

This study was conducted as part of the RACER IV winter expedition to the coastal region of the Antarctic Peninsula from July 14 through Aug. 12, 1992. In this paper the authors report on the final results of experiments conducted on *Euphausia superba*. These results substantiate their conclusion that *E. superba* can continue to grow throughout the winter while feeding on a diet of zooplankton. Zooplankton that suspend growth during the winter in polar regions typically reduce their metabolic rate. *E. superba*, however, does not appear to reduce its nitrogen metabolism; from this, and from observations of continued high respiration rates in winter and the feeding on zooplankton, the authors infer that *E. superba* continues to grow in winter.

B-51046

El-Sayed, S.Z., ed, **Southern ocean ecology: the BIOMASS perspective**, Cambridge, University Press, 1994, 399p., Refs.

passim. For individual papers see B-51047, B-51052 through B-51067, B-51069 through B-51071, F-51068 and J-51048 through J-51051.

DLC QH95.58.S68

This book is the proceedings of the BIOMASS Colloquium held in Bremerhaven, Germany in Sep. 1991. It is a record of accomplishments of the international BIOMASS program during the decade of the 1980s. The volume consists of 22 chapters in 6 sections, each section ending with an article called "Discussant's report". The chapter arrangement follows closely the organizational structure of the Colloquium. The opening chapter gives a short history of BIOMASS, which is followed by descriptions of the physical and chemical settings of two regions of the southern ocean, the southwest Atlantic Ocean and the Prydz Bay area (in the Indian Sector), followed by chapters on phytoplankton and zooplankton. The chapters on higher trophic levels, namely fish and birds, document BIOMASS accomplishments in ichthyo- and avifauna research. The interactions among these trophic levels are highlighted in the chapters presented on the subject. The final chapters are intended as a look to the future, ending with a critical appraisal of the BIOMASS Program.

B-51047

El-Sayed, S.Z., **History, organization and accomplishments of the BIOMASS Programme**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.1-8, 4 refs.

DLC QH95.58.S68

This chapter provides an outline of the background and history of the BIOMASS Programme, its implementation and objectives, priorities, organizational structure and coordination. The 1st and 2nd international BIOMASS experiments (FIBEX and SIBEX) are summarized. The role BIOMASS has played in fostering international scientific cooperation is considered to be one of its great accomplishments.

B-51052

Schnack-Schiel, S.B., Mujica, A., **Zooplankton of the Antarctic Peninsula region**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.79-92, Refs. p.89-92.

DLC QH95.58.S68

This chapter summarizes the results of zooplankton research carried out in the vicinity of the Antarctic Peninsula (Atlantic Section) during BIOMASS. While zooplankton standing stocks and composition in the upper 1000 m in the open sea and within the pack-ice in the western Weddell Sea in Mar. 1986 were roughly equivalent, there are significant differences in the vertical distribution. Zooplankton biomass and respiratory activity (ETS) were relatively high in the ice edge region in Nov.-Dec 1988, while low biomass and activity were encountered under the pack-ice. The high ETS activities coincided with maximum concentrations of chlorophyll *a*.

B-51053

Hosie, G.W., **Macrozooplankton communities in the Prydz Bay region, Antarctica**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.93-123, Refs. p.121-123.

DLC QH95.58.S68

The purpose of this chapter is to present new results that redress the lack of knowledge of zooplankton community ecology in the Prydz Bay area. The Australian Antarctic Division carried out 4 geographically extensive surveys of the Prydz Bay region between 1981 and 1987, covering the summer months of Nov.-Mar. The resulting zooplankton data sets are the most comprehensive for the region produced under the auspices of BIOMASS. These data sets were analyzed by a combination of multi- and univariate analytical techniques to define the zooplankton communities in the region, species composition and affinities, indicator species characteristic of each community, and variability in community patterns. It was found that, for the greater part of the Prydz Bay region, *E. superba* was not widely distributed in great abundance. Instead, there were a number of assemblages dominated by zooplankters other than krill. *E. superba* would appear to be associated more with the shelf edge, rather than with any other feature such as ice; but within that area where various predators

feed, *E. superba* is the predominant species, almost to the exclusion of other zooplankton. Despite the dominance of other species in other areas, *E. superba* is still the most important single species in Prydz Bay.

B-51054

Everson, I., Miller, D.G.M., **Krill mesoscale distribution and abundance: results and implications of research during the BIOMASS Programme**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.129-143, Refs. p.141-143.

DLC QH95.58.S68

This paper considers the questions of mesoscale distribution of krill and the applications of acoustics to determining distribution and abundance. These topics were highlighted as warranting specific research effort when the BIOMASS Program began. The authors discuss the progress that has been made in these areas in the light of the aims of BIOMASS and their relevance and application to the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), an organization with roots in BIOMASS. The authors begin at the largest spatial scale and discuss the question of stock separation; they then consider progress that has been made in estimating standing stock, and finally consider the commercial fishery for krill in the southern ocean.

B-51055

Siegel, V., Kalinowski, J., **Krill demography and small-scale processes: a review**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.145-163, Refs. p.159-163.

DLC QH95.58.S68

A number of research programs were developed by BIOMASS with the view that they should be modified with increasing knowledge over time. Some of the specific proposals considered in this contribution include: a description of the spatial distribution of krill in order to determine ranges of biomass densities and the shape, extent and stability of swarms, especially diel changes; determination of the growth rate and longevity using laboratory and field experiments; and collection and analysis of length composition data for krill collected in all seasons and areas.

B-51056

Quetin, L.B., Ross, R.M., Clarke, A., **Krill energetics: seasonal and environmental aspects of the physiology of *Euphausia superba***, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.165-184, Refs. p.180-184.

DLC QH95.58.S68

Current knowledge of the energetics of *Euphausia superba* is reviewed, emphasizing those topics where knowledge has developed since the previous review by Clarke & Morris (1983). The discussion is based on the energy budget, and it progresses from topics of uncertainty and debate to topics with more general agreement. The authors conclude with a discussion of the more ecological aspects of the interface between the energetics and the environment of krill.

B-51057

Miller, D.G.M., **Discussant's report: evaluation of BIOMASS contribution to krill research**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.185-188, 9 refs.

DLC QH95.58.S68

A broad overview is provided of information contained in 3 papers presented at the krill session of the BIOMASS Colloquium. The review is structured around three spatial scales: the meso- or 'regional' scale, the micro- or 'aggregation' scale, and the individual or 'physiological' scale. The three brief outlines point to the successes as well as to some shortcomings of many BIOMASS-related activities.

B-51058

Kellermann, A., North, A.W., **Contribution of the BIOMASS Programme to antarctic fish biology**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge,

University Press, 1994, p.191-209, Refs. p.203-209.

DLC QH95.58.S68

After an introductory review of the history of BIOMASS fish research activities, the present state of knowledge of antarctic fish is summarized. The review of the main fields to which the program has made a substantial contribution covers primarily the members of the dominant notothenioid suborder. A note is included on the mesopelagic fish species whose importance in the marine ecosystem is becoming increasingly recognized.

B-51059

Williams, R., Duhamel, G., **Studies on fish of the Indian Ocean sector of the southern ocean during the BIOMASS Programme**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.211-229, Refs. p.228-229.

DLC QH95.58.S68

The specific objectives of BIOMASS emphasized krill as the major potential food resource of antarctic waters and as a key element of the marine food web. However, other antarctic marine studies were recognized as important, including autecological studies of fishes, assessment of their biomass and production in selected areas of the southern ocean, and description of the major food chains. This type of approach was particularly important in the context of this chapter, because before BIOMASS virtually nothing was known about fish in the Indian Ocean sector. As little data have been published since BIOMASS fieldwork started, this paper deals first with the basic information such as distribution and abundance before proceeding to more general topics.

B-51060

Hunt, G.L., Croxall, J.P., Trathan, P.N., **Marine ornithology in the southern Drake Passage and Bransfield Strait during the BIOMASS Programme**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.231-245, Refs. p.243-245.

DLC QH95.58.S68

In their review of BIOMASS, the authors discuss the ecological and management implications of ornithological observations in southern Drake Passage and Bransfield Strait. They also review what they have learned about the influence of methods on the quality and interpretation of the available data, as well as limitations in how the data may be used.

B-51061

Cooper, J., Woehler, E.J., **Consumption of antarctic krill (*Euphausia superba*) by seabirds during summer in the Prydz Bay region, Antarctica**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.247-260, Refs. p.258-260.

DLC QH95.58.S68

In this chapter the authors estimate the consumption of antarctic krill by seabirds (including penguins) in the Prydz Bay region during summer, based on data from at-sea observations, supported by dietary studies and censuses conducted at breeding colonies, and discuss problems and biases in such an approach. Observations of seabirds were made during three Australian and two South African BIOMASS cruises to the Prydz Bay region during the period from 1981 to 1985.

B-51062

Marchant, H.J., Murphy, E.J., **Interactions at the base of the antarctic food web**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.267-285, Refs. p.281-285.

DLC QH95.58.S68

Extensive studies in the 1970s and 1980s demonstrated that the primary productivity of the southern ocean is highly variable and comparable with the annual production rates found in oligotrophic tropical waters. Here the authors consider the major developments that have taken place in the last decade and give an overview of the status of knowledge of some of the key groups of organisms. They then discuss the spatial and temporal variability and dynamics of the lower levels of the ecosystem, the larger-scale role of the antarctic marine ecosystem, and some of the planned future directions for research.

B-51063

Kock, K.H., Shimadzu, Y., **Trophic relationships and trends in population size and reproductive parameters in antarctic high-level predators**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.287-312, Refs. p.308-312.

DLC QH95.58.S68

In reviewing what has been accomplished within the BIOMASS Program on higher trophic levels in the food webs of the southern ocean, the authors have focused here on population sizes and trends and their possible causes, on changes in reproductive parameters, and on interactions within the higher trophic levels and with other components of the food webs.

B-51064

Thorley, M.R., Trathan, P.N., **History of the BIOMASS Data Centre and lessons learned during its lifetime**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.313-321, 14 refs.

DLC QH95.58.S68

Before the BIOMASS Data Centre was set up there was little or no previous experience of organizing large-scale biological databases and little experience of how an antarctic biological data center should be run. This paper is intended to provide an overview of how the BIOMASS Data Centre was developed, as well as to highlight a number of insights and lessons which have been learned and which may be applied in the future. As the initial objectives for the BIOMASS Data Centre were revolutionary in aspect, this paper is not offering criticism, but considers the lessons learned and how they may be applied to future SCAR information management systems.

B-51065

Laws, R.M., **Discussant's report: antarctic marine systems**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.323-327, 7 refs.

DLC QH95.58.S68

The following is reviewed: types of antarctic marine ecosystems, including the energy fluxes; the nature of antarctic ecosystems, including the lower and higher trophic levels; and future research needs. It is concluded that despite the undoubted success of the BIOMASS Program, there is still little coordination among workers on the different groups of organisms in the southern ocean, and that there is an urgent need to promote this by interdisciplinary studies within regions. Integrated studies of interactions between and within trophic levels should be promoted more actively.

B-51066

Priddle, J., Thorley, M.R., Trathan, P.N., **Potential contribution of the BIOMASS Programme to global change research, especially the JGOFS core project of IGBP**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.331-338, 12 refs.

DLC QH95.58.S68

The authors start with brief reviews of the BIOMASS Program and its evolution, and consideration of global change research; the general ways in which these two areas of science could be linked are identified. A detailed consideration of the BIOMASS data and other products which could feed into global change research is presented. The authors conclude with recommendations for the most likely ways in which the BIOMASS Program can contribute to global change research.

B-51067

Croxall, J.P., **BIOMASS-CCAMLR relations: past, present and future**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.339-353, 23 refs.

DLC QH95.58.S68

This chapter briefly reviews the following: the historical links between BIOMASS and CCAMLR over the period when the active BIOMASS Program contributed significantly to the development and operation of the Scientific Committee for the Conservation of Antarctic Marine Living Resources (SC-CAMLR); the present situation, with a very active program of research, evaluation and management within CCAMLR, coinciding with the conclusion of the BIOMASS Program; and the most practical and productive future scientific relations between SCAR and CCAMLR. The chapter treats CCAMLR in great detail. It focuses on the South Atlantic sector of the southern ocean, because this is where most of the fisheries regulated by CCAMLR are found, and because it was also the principal area of BIOMASS research.

B-51069

Sherman, K., **Antarctic marine ecosystem in global perspective**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.363-375, Refs. p.373-375.

DLC QH95.58.S68

The antarctic marine ecosystem is the largest global area where focused scientific efforts are under way in support of the conservation and management of living marine resources from an ecosystems perspective. In the 1980s the fisheries for krill and finfish raised questions concerning the long-term sustainability of antarctic living marine resources. The concerned nations established the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). CCAMLR is developing and implementing a program of research, monitoring, and management from a holistic ecosystem perspective.

B-51070

Hempel, G., **Discussant's report: the legacy of BIOMASS**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.377-381, 13 refs.

DLC QH95.58.S68

The state of knowledge of the living resources of the southern ocean at the time of the launching of BIOMASS in 1976 is summarized. It is found that a little more than a decade later, at the end of BIOMASS, the southern ocean scene has greatly changed, in that greater caution is exercised in evaluating the productivity of the southern ocean and its potential resources. The organizational structure and the organization's future are discussed.

B-51071

Fogg, G.E., **Critical appraisal of the BIOMASS Programme**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.383-389, 23 refs.

DLC QH95.58.S68

In this evaluation of the BIOMASS program, the author reviews the basic concepts of BIOMASS; two aspects of biological oceanography covered by BIOMASS, the ultraplankton and physical oceanography in relation to the biology; features of BIOMASS as collectivized research; the results achieved by BIOMASS and their practical value; and BIOMASS and the understanding of ecosystem functioning, with particular attention paid to mathematical modelling.

B-51074

Chapman, B.E., Roser, D.J., Seppelt, R.D., **¹³C NMR analysis of antarctic cryptogam extracts**, *Antarctic science*, Sep. 1994, 6(3), p.295-305, Refs. p.304-305.

Water soluble compounds were extracted from the dominant cryptogams of the Windmill Is. and compared with standard polyols, sugars and amino acids using ¹³C nuclear magnetic resonance (NMR) spectroscopy. Previous findings for sugars and polyols from gas liquid chromatography were validated and extended. Arabitol, ribitol and mannitol were confirmed as the major soluble carbohydrate compounds in all lichen species examined. Sucrose, fructose and glucose, but no polyols, were detected in two species of moss. Sorbitol was confirmed as a major component of the algae *Prasiola crispa* and *Schizogonium murale*. *Mesotaenium bergrenii* was confirmed to contain sucrose and glucose. No significant quantities of sugars or polyols or any other compound were found in extracts of the red

snow alga *Chloromonas* sp. 1. Amino acids were detected in the majority of cryptogam samples and were particularly abundant in the algae *P. crispa* and *S. murale*. In the latter species the total identified acids ranged from 13.5-66 mg/g dry weight. ¹³CNMR was confirmed as a powerful tool for the characterization of low molecular weight constituents of antarctic cryptogams. (Auth. mod.)

B-51077

James, S.R., Burton, H.R., McMeekin, T.A., Mancuso, C.A., **Seasonal abundance of *Halomonas meridiana*, *Halomonas subglaciescola*, *Flavobacterium gondwanense* and *Flavobacterium salegens* in four antarctic lakes**, *Antarctic science*, Sep. 1994, 6(3), p.325-332, Refs. p.331-332.

Indirect immunofluorescence was used to quantify the seasonal variation of four halophilic aerobic bacteria in antarctic saline lakes from July 1990 to Jan. 1991. Antibodies were raised against type strains from the Australian Collection of Antarctic Microorganisms. During summer, all 4 serogroups were identified in the aerobic waters of lakes with total dissolved salts above 61 per mill. Maximal abundances of *Halomonas meridiana*, *H. subglaciescola* and *Flavobacterium gondwanense* serogroups were observed at discrete depths within the water column in the two most hypersaline lakes at about midsummer, coincident with the time of maximum sunlight and the commencement of the summer thaw. At this time the *Halomonas* spp. serogroups comprised up to 40% of the total bacteria and the *F. gondwanense* serogroup up to 10% of the total bacteria. The *F. salegens* serogroup was in low numbers (>2% of total bacteria) in some aerobic waters. Up to 2% of the total bacterial populations in the lakes were autofluorescent or stained non-specifically. Dissolved organic carbon values were measured throughout the sampling period and correlated well with total bacterial numbers but not with changes in species composition. Change in species abundance, as indicated by immunofluorescence, was not reflected in the total bacterial count, indicating compositional change of the total bacterial population. (Auth.)

B-51078

Statham, J.A., McMeekin, T.A., **Survival of faecal bacteria in antarctic coastal waters**, *Antarctic science*, Sep. 1994, 6(3), p.333-338, 13 refs.

The effect of solar radiation on the survival of *Escherichia coli*, *Salmonella zanzibar* and a faecal *Streptococcus* strain in seawater was tested in laboratory experiments, and survival of *E. coli* was tested under natural light conditions at Davis Station. Exposure to artificial light of wavelengths 290-800 nm caused a rapid decline in viability of each strain examined. The visible band of the spectrum (400-800 nm) also had detrimental effects on faecal bacteria, when compared with survival in the absence of light. Rates of decline for *E. coli* in natural light in Antarctica were similar to those from laboratory experiments. However, resuscitation of sub-lethally damaged cells under optimum conditions resulted in greater recovery rates than were observed after exposure to artificial sunlight. Faecal bacteria were rapidly inactivated when exposed to sunlight in antarctic waters, and as repair mechanisms are unlikely to operate under *in situ* conditions, resuscitation of sub-lethally damaged cells is improbable. (Auth. mod.)

B-51079

Vincent, W.F., Howard-Williams, C., **Nitrate-rich inland waters of the Ross Ice Shelf region, Antarctica**, *Antarctic science*, Sep. 1994, 6(3), p.339-346, Refs. p.345-346.

Nutrient and major ion concentrations were measured in surface water samples from lakes, ponds and streams at sites 30-320 km south of McMurdo Sound: the Darwin Glacier region, Pyramid Trough in the southern Dry Valleys, and the McMurdo Ice Shelf ablation zone. These aquatic environments ranged from dilute meltwaters to concentrated brines. The lowest nitrate concentrations were recorded at the sites closest to the seasonally open waters of the Ross Sea. Much higher values were recorded at sites further south. These observations support the hypothesis that NO₃⁻ precipitation over Antarctica is of stratospheric rather than coastal marine origin. The nitrogen-rich waters contained chloride and nitrate in the ratio 5.45 g Cl:1 g N (C.V.=8.4%) which is within the range for antarctic snow, and indicative of nitrate enrichment by freeze concentration processes. Cyanobacterial mats were conspicuous elements of the biota across the full range of salinities, and were usually dominated by oscillatoriacean species. Nitrogen-fixing cyanobacteria and diatoms were

also represented in these benthic microbial communities at the more northern sites, but were absent from all samples from the Darwin Glacier region. (Auth.)

B-51080

Williams, R., Smolenski, A.J., White, R.W.G., **Mitochondrial DNA variation of *Champscephalus gunnari* Lönnberg (Pisces: Channichthyidae) stocks on the Kerguelen Plateau, southern Indian Ocean, *Antarctic science*, Sep. 1994, 6(3), p.347-352, Refs. p.351-352.**

The distribution of the icefish *Champscephalus gunnari* on the Kerguelen Plateau is confined to the inner shelves of Heard and Kerguelen islands and outlying banks where the water depth is less than 350 m. For fisheries management purposes, it is necessary to know whether fish from the various shelves and banks belong to one single or several separate populations. Analysis of the mitochondrial DNA of fish from various localities using restriction endonuclease enzymes revealed no significant genetic heterogeneity between any of the localities. This does not preclude the existence of isolated stocks at the present time but indicates that the populations have been separated too recently for genetic isolation to be manifested, or that low-level interchange of fish between the populations may be maintaining genetic homogeneity. (Auth.)

B-51081

Prince, P.A., Huin, N., Weimerskirch, H., **Diving depths of albatrosses, *Antarctic science*, Sep. 1994, 6(3), p.353-354, 21 refs.**

To see if albatrosses routinely submerge (and what depths they attain) while on foraging trips to sea, light-weight capillary gauges were used to record maximum dive depths for 4 species of albatross. All but one (from a black-browed albatross) of the 53 capillary gauges were recovered successfully. The mean maximum dive depths recorded are summarized in a table. No wandering albatross reached 1 m depth and for one bird no submersion was detectable. This was significantly different from the other species, in which every bird submerged and only 5 individuals failed to exceed 1 m. For black-browed and grey-headed albatrosses, there were no significant differences between species in dive depths attained. Light-mantled sooty albatrosses reached significantly greater depths than the 2 mollymawk species combined. For no species was there any significant relationship between dive depth and deployment interval, suggesting that overestimation of depth due to the potential effects of repeated plunge-diving was not a problem. (Auth. mod.)

B-51092

Peck, L.S., Morris, D.J., Clarke, A., **Oxygen consumption and the role of caeca in the Recent Antarctic brachiopod *Liothyrella uva notorcadensis* (Jackson, 1912), Actes du 1er Congrès International sur les Brachiopodes, Brest 1985. Les Brachiopodes fossiles et actuels (International Symposium on Brachiopods, 1st, Brest, France, 1985. Proceedings. Fossil and contemporary brachiopods, edited by P.R. Racheboeuf and C. Emig) and Biostratigraphie du Paléozoïque, N.4, Brest, Université de Bretagne Occidentale, 1986, p.349-355, 16 refs.**

DLC QE796.C625

The physiology of the Recent Antarctic articulate brachiopod *Liothyrella uva notorcadensis* (Jackson, 1912) is under investigation as part of a study of overwintering strategies in polar marine invertebrates. Basal metabolic rate (BMR) was estimated for 36 brachiopods ranging in shell length from 30 to 37 mm by measuring the oxygen consumption of animals previously starved for a minimum of 14 days. Caecal respiration accounted for 26% of the total BMR, internal tissues 29%; the respiratory cost of ventilation was estimated as 42% and the remaining 4% was attributed to oxygen uptake by the pedicle. The role of caeca in respiration was examined by measuring the rates of oxygen consumption of animals held tightly closed and/or coated externally with epoxy resin. There was no evidence for oxygen diffusion through the punctae to meet the respiratory demand of the internal tissues of a closed animal. (Auth. mod.)

B-51093

Branch, M.L., Williams, G.C., **Hydrozoa, Octocorallia and Scleractinia of subantarctic Marion and Prince Edward Islands: illustrated keys to the species and results of the 1982-**

1989 University of Cape Town surveys, *South African journal of antarctic research*, 1993, 23(1 & 2), p.3-24, Refs. p.22-24.

The benthic Hydrozoa Octocorallia and Scleractinia (Cnidaria) of subantarctic Marion and Prince Edward Is. were sampled over the period 1982-1989 by dredging, scuba diving and intertidal surveys. Illustrated keys are provided for the identification of all species recorded from the islands during this and previous surveys. Summaries are provided of the depth distributions, abundances and habitats of the species, and the geographical distribution is discussed. The currently known fauna comprises 31 species of Hydrozoa (of which 18 are new records including 2 unidentified), 14 species of Octocorallia (of which 8 are new records including 3 unidentified) and 6 species of Scleractinia (of which 4 are new records with one identified to genus and one a probable new genus). New taxa are not formally described in this paper. (Auth.)

B-51095

Heyns, J., ***Eudorylaimus nudicaudatus* sp.n. from Antarctica (Nematoda: Dorylaimoidea), *South African journal of antarctic research*, 1993, 23(1 & 2), p.33-36, 9 refs.**

Eudorylaimus nudicaudatus sp.n. is described from western Queen Maud Land. The new species is characterized by an exceptionally small stylet aperture and by the fact that the outer layer of the cuticle does not embrace the tail terminus. *E. nudicaudatus* sp.n. is compared with other *Eudorylaimus* spp. described from antarctic regions, viz. *E. antarcticus* (Steiner 1916) and six species described by Loof (1975): *E. verrucosus*, *E. isokaryon*, *E. spaulli*, *E. coniceps*, *E. pseudocarteri* and *E. paradoxus*. (Auth.)

B-51096

Branch, M.L., et al, **Echinodermata of subantarctic Marion and Prince Edward Islands, *South African journal of antarctic research*, 1993, 23(1 & 2), p.37-70, Refs. p.69-70.**

The Echinodermata of Marion and Prince Edward Is. were sampled over the period 1982-1989. This paper comprises illustrated keys to all the species of Echinodermata collected during these and previous surveys. A total of 69 species, including 31 new records of Echinodermata, are now known from Marion I. These comprise 33 Asteroidea, 22 Ophiuroidea, 10 Holothuroidea, 2 Echinoidea and 2 Crinoidea. Summaries are provided of the depth distribution, abundances and habitats, as well as the geographical distribution of the species. The Asteroidea include more cosmopolitan and warm-water species and have a greater affinity to the Falklands than do the Ophiuroidea and Holothuroidea, which are largely confined to the Antarctic and Subantarctic and have a greater affinity to the Kerguelen Is. Asteroidea from deep rocky areas have an affinity to the Falklands, while those from shallow sandy localities are shared with Kerguelen. (Auth. mod.)

B-51097

Hofmeyr, G.J.G., Bester, M.N., **Predation on King penguins by antarctic fur seals, *South African journal of antarctic research*, 1993, 23(1 & 2), p.71-74, 16 refs.**

Adult male antarctic fur seals *Arctocephalus gazella* were observed pursuing, killing and eating adult King penguins on Marion I. The majority of the King penguins were pursued on land. This is the first time that members of the Otariidae have been reported to take seabirds as large as King penguins, and the first time fur seals have been reported to take penguins ashore. (Auth.)

B-51098

McInnes, S.J., Ellis-Evans, J.C., **Tardigrades from maritime antarctic freshwater lakes, International Symposium on the Tardigrada, 4th, Modena, Italy, Sep. 3-5, 1985. Proceedings. Biology of Tardigrades, edited by R. Bertolani and Selected Symposia and Monographs U.Z.I., 1, Modena, Mucchi, 1987, p.111-123, Refs. p.122-123.**

DLC QL447.5.I57

The lakes of Signy I. encompass a wide range of trophic status from ultra-oligotrophic to grossly eutrophic, and are ice-covered for 8-12 months each year. These lakes have restricted faunal diversity and tardigrades represent a significant component of the fauna in numerical terms. In this preliminary study, 12 species of Tardigrada (including one heterotardigrade) have been identified, of which *Hypsibius arcticus*, *Diphascon*

pingue, *Isohypsibius asper*, and *I. papillifer* were the most frequently encountered. On an inter-lake basis, relatively little difference was noted in population composition. Highest numbers and diversity were associated with filamentous green algal and cyanobacterial assemblages which occurred most extensively in the region of the lake outflow. Tardigrade numbers on an area basis were far higher in lake outflow sites than virtually any terrestrial site on Signy I. (Auth. mod.)

B-51112

Kuznetsov, V.D., Filippova, S.N., **Confirmation of the taxonomic status of *Nocardiopsis antarcticus* and addendum to diagnosis of the species**, *Microbiology*, Mar. 1994, 62(5), p.555-556, Translation of *Mikrobiologiya*, 62(5):928-931, Sep./Oct. 1993. 11 refs.

DNA homology of *Nocardiopsis dassonvillei* and *N. antarcticus* was studied to establish the taxonomic status of *N. antarcticus*. The level of DNA-DNA hybridization was as low as 35%, i.e., significantly lower than the intraspecies hybridization level. Thus, the taxonomic status of *N. antarcticus* as a separate species is confirmed, and this is the basis for its transfer from the group "Species Incertae Sedis" into the category of legitimate species. Presented here is an amplified diagnosis of the species based on this data and on previously published results. Details of the results, such as shape, structure, biochemistry, color, growth, and growth temperature, are given and compared to previous research to arrive at the conclusion of the separate species status for *N. antarcticus*. (Auth. mod.)

B-51113

Leakey, R.J.G., Fenton, N., Clarke, A., **Annual cycle of planktonic ciliates in nearshore waters at Signy Island, Antarctica**, *Journal of plankton research*, July 1994, 16(7), p.841-856, 67 refs.

The abundance and biomass of marine planktonic ciliates in Borge Bay, Signy I. were determined at monthly intervals between Apr. 1990 and June 1991. At least 24 different ciliate taxa were recorded from samples preserved in Lugol's iodine, including the tintinnids *Codonellopsis balechi*, *Cymatocylis convallaria*, *Laackmaniella naviculaefera* and *Salpingella* sp., and the aloricate taxa *Didinium* sp. and *Mesodinium rubrum*. Ciliate abundance and biomass exhibited a clear seasonal cycle with high values during the austral summer and low values in the austral winter. Small ciliates dominated abundance throughout the year, and biomass during winter. Larger ciliates contributed most to biomass during summer. Aloricate ciliates were common throughout the year, while tintinnids contributed substantially to abundance and biomass only during summer. *Salpingella* sp. was the most common tintinnid, but *C. convallaria* contributed most to tintinnid biomass. The seasonal pattern of ciliate abundance and biomass matched that of chlorophyll *a* concentration and bacterial biomass, suggesting tight trophic coupling between ciliates and other components of the pelagic microbial community. (Auth. mod.)

B-51114

Light and productivity of antarctic plankton during austral summer in an ice edge region in the Weddell-Scotia Sea, *Journal of plankton research*, July 1994, 16(7), p.912, The article being corrected is cited: F.G. Figueiras, F.F. Pérez, Y. Pazos, and A.F. Rios: Light and productivity of antarctic phytoplankton during austral summer in an ice edge region in the Weddell-Scotia Sea; *Journal of plankton research*, 16:233-253, 1994. For this article see B-51175.

This single page item provides corrections to Equations (2) and (5) as they appeared in the original work.

B-51116

Vinciguerra, M.T., ***Metacrolobus festonatus* gen. n. sp. n. and *Scottnema lindsayae* Timm, 1971 (Nemata: Cephalobidae) from subantarctic and antarctic regions with proposal of the new subfamily Metacrolobinae**, *Fundamental and applied nematology*, Mar. 1994, 17(2), p.175-180, With French summary. 5 refs.

A SEM study is conducted for the first time on *Scottnema lindsayae* Timm, 1971 from Antarctica. *Metacrolobus festonatus* gen. n., sp. n. from Tierra del Fuego is described and illustrated. This new genus, included

among Cephalobidae, is characterized by having three leaf-like lips (the dorsal one larger than the two subventrals) with incised margins and three tangential ridges around stoma, connected with lips by three pairs of radial ridges. The family Cephalobidae is discussed and the new subfamily Metacrolobinae is erected to accommodate the new genus *Metacrolobus* gen. n. (Auth.)

B-51126

Rosenberg, J.E., Hewitt, R.P., Holt, R.S., **U.S. Antarctic Marine Living Resources (AMRL) program: 1991-1992 field season activities**, *Antarctic journal of the United States*, 1992, 27(5), p.209-210.

The U.S. Antarctic Marine Living Resources (AMLR) program provides information used to develop U.S. policy on the conservation and international management of resources living in antarctic waters. The program advises the U.S. delegation to the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), which is part of the Antarctic Treaty System. During the last 6 austral summers, the AMLR program has conducted research in the vicinity of Elephant I., at the tip of the Antarctic Peninsula. As in the past three field seasons, the 1991-1992 AMLR field program included a 2-month research cruise aboard the National Oceanic and Atmospheric Administration (NOAA) ship *Surveyor* and land-based studies at a seasonal field camp on Seal I. off the northwest coast of Elephant I., and at Palmer Station.

B-51127

Hewitt, R.P., Demer, D.A., **AMLR program: Distribution and abundance of krill near Elephant Island in the 1992 austral summer**, *Antarctic journal of the United States*, 1992, 27(5), p.210-212, 9 refs.

One of the principal goals of the Antarctic Marine Living Resources (AMLR) program is the relation of the feeding ecology and reproductive success of krill predators to aspects of the prey field. The authors used bioacoustic methodology to map the distribution of krill and to estimate biomass. Specific objectives for the 1992 field season included the following: map meso-scale (10s to 100s of km) features of the distribution, density, and abundance of krill in the area around Elephant I.; and map micro-scale (1-10s of km) features of the distribution, density, and abundance of krill immediately north of Elephant I., within the foraging range of krill predators breeding at Seal I. The authors estimated biomass to be 0.4 million metric tons. During the final survey conducted 6 weeks after the first survey, krill were mapped in reduced densities primarily to the west of Elephant I.; biomass over the larger survey area had declined to 1.1 million metric tons.

B-51128

Croll, D.A., et al, **AMLR program: Penguin and fur seal studies on Seal Island, South Shetland Islands, 1991-1992 austral summer**, *Antarctic journal of the United States*, 1992, 27(5), p.213-214, 1 ref.

Fur seal pup weights during Jan. and Feb. 1992 were higher than in previous years, and the number of chinstrap penguins and cape petrels attempting to breed on Seal I. was the highest recorded since observations began in 1987-1988. The number of chicks that hatched was also relatively high, and fur seal foraging trips were shorter than in 1990-1991. These patterns suggest that the conditions (e.g., local food availability) prior to the initiation of breeding and early in the breeding season (early lactation and egg laying and incubation periods) were relatively good. It is concluded that the favorable conditions present earlier in the season may have persisted through the penguin guard and early creche stages. The observations that the size and weight of fledglings in 1991-1992 were similar to those observed in 1990-1991 suggest that prey availability may have been reduced during the latter portion of the breeding season. These hypotheses are supported by the observations of cape petrel reproductive success, which was particularly high during the 1991-1992 season. More petrels attempted to breed, and most of the chicks that hatched survived to fledging. However, the weight of cape petrel chicks prior to fledging was similar to the previous year.

B-51129

Loeb, V., Siegel, V., **AMLR program: Krill stock structure in the Elephant Island area, January to March 1992**, *Antarctic*

journal of the United States, 1992, 27(5), p.214-216, 7 refs.

Net sampling operations during the Antarctic Marine Living Resources (AMLR) program's 1991-1992 field season provided data on krill stock structure in the Elephant I. area. Information on the length, sex ratio, reproductive condition, and maturity states was derived from oblique tows in the upper 200 m. The results from the large-area surveys (surveys A and D) are summarized here. A total of 6,120 krill were collected during survey A. The median abundance was 0.9 krill per sq m. The 67 tows made during survey D caught 10,867 krill. Despite the lower acoustically detected biomass estimate, the median abundance value (1.1 per sq m) was slightly larger than that during survey A. Relatively large catches occurred at scattered locations around Elephant I.

B-51130

Helbling, E.W., Sala, L.O., Loeb, V., **AMLR program: Feeding of krill around Elephant Island, Antarctica—phytoplankton biomass in digestive tracts and rates of clearance**, *Antarctic journal of the United States*, 1992, 27(5), p.217-218, 7 refs.

In order to obtain estimates of the grazing pressure (feeding rate) exerted by krill upon phytoplankton, it is necessary to have estimates of both the clearance (or filtering) rates and the krill biomass. Filtering rates can vary over a wide range, depending on food quantity and quality. During Jan. to Mar. 1992, the authors performed feeding experiments and gut content fluorescence analyses on krill collected around Elephant I. In this paper the authors present data on clearance rates, gut-passage time and gut content of krill. This work was part of the U.S. AMLR program and was done on board National Oceanic and Atmospheric Administration (NOAA) ship *Surveyor*.

B-51133

Villafañe, V.E., Casco, S.M., Helbling, E.W., Holm-Hansen, O., **AMLR program: Distribution of phytoplankton species relative to water masses around Elephant Island, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.223-224, 8 refs.

Data from the AMLR 1990-1991 field season showed that the microplankton carbon accounted for 23 to 68% of the total autotrophic carbon in the area around Elephant I. Since the determination of total autotrophic carbon of the 136 stations sampled during the 1991-1992 field season is still in progress, in this paper the authors report only the microplankton species distribution and their relation with the water masses observed in the area. Eight clusters were determined by the analyses, with each one characterized by the dominance of different species or set of species. During survey A, the net phytoplankton throughout the entire study area was dominated by diatom species. The spatial distribution of the four main clusters of stations is shown in a figure. Survey D showed a predominance of the silicoflagellate *Distephanus speculum* in cluster V at the northwestern part of the sampling grid.

B-51134

Cochlan, W.P., **AMLR program: Bacterioplankton production rates in the vicinity of Elephant Island, Antarctica, during late austral summer**, *Antarctic journal of the United States*, 1992, 27(5), p.225-226, 13 refs.

As part of the U.S. AMLR program, a comprehensive study of the abundance and activity of heterotrophic bacterioplankton was conducted during Leg II of the 1992 austral summer cruise of the NOAA ship *Surveyor*. In this paper, the author reports the production rates of bacterioplankton near Elephant I., an area of krill abundance. The results of this study so far demonstrate that bacterioplankton are indeed a quantitatively important component of the food web in the vicinity of Elephant I. during the late austral summer.

B-51135

Wormuth, J.H., Fernandes, L., Yeager, M., **AMLR program: Vertical distribution of krill and horizontal distributions of macrozooplankton in the vicinity of Elephant Island**, *Antarctic journal of the United States*, 1992, 27(5), p.226-227, 4 refs.

An example of the vertical structure of krill is shown in a figure. Generally, the best catches were between 15 and 100 m. There were some statistically significant differences in mean size and depth. The krill from 25 to 50 m were larger than those collected in horizontal tows from 15 to 25 m within a strongly defined acoustic layer, based on nonoverlapping 95%

confidence intervals. Isaacs-Kidd midwater trawl tows were taken at each station in two large-area surveys centered around Elephant I. On the first survey, *Salpa thompsoni* was most abundant in the eastern portion of the survey area, which was also the area east of the Weddell/Scotia Confluence. Other taxa, although widespread, revealed no obvious areal patterns.

B-51138

Ross, R.M., Quetin, L.B., **Palmer long-term ecological research (LTER): An overview of the 1991-1992 season**, *Antarctic journal of the United States*, 1992, 27(5), p.235-236, 5 refs.

The Palmer LTER, established in Oct. of 1990, focuses on the pelagic marine ecosystem in the Antarctic and on the ecological processes which link the extent of annual pack ice to the biological dynamics of different trophic levels. In the region around Palmer Station west of the Antarctic Peninsula, the maximum extent of pack ice varies from near zero to half-way across Drake Passage and appears to vary on a 6- to 8-year cycle. Satellite data on the maximum extent of pack ice in the Weddell Sea sector show cold winters with heavy ice pack in 1973, 1980 and 1981, and personal observations confirm that winters of 1980, 1981, 1986 and 1987 had heavy ice cover in the region around Palmer Station. During the first season the Palmer LTER staged two major research efforts: an austral spring cruise on the R/V *Polar Duke* from Nov. 7-21, 1991, and a nearshore monitoring and experimental program centered at Palmer Station from Oct. 15, 1991 to Mar. 7, 1992.

B-51141

Prézelin, B.B., et al, **Palmer LTER program: Spatial variability in phytoplankton distribution and surface photosynthetic potential within the peninsula grid, November 1991**, *Antarctic journal of the United States*, 1992, 27(5), p.242-244, 5 refs.

As part of the long-term ecological research program (LTER) 1991 austral spring cruise, which defined the biological, chemical, optical, and physical properties of marginal ice zone (MIZ) west of the Antarctic Peninsula, the authors resolved the mesoscale variability in phytoplankton biomass, photosynthetic potential, and community composition. Preliminary results of three transects completed across the MIZ on the R/V *Polar Duke* are presented here. Two figures indicate station locations and discrete depths sampled with a bio-optical profiling system (BOPS II).

B-51142

Quetin, L.B., et al, **Palmer LTER program: Biomass and community composition of euphausiids within the peninsula grid, November 1991 cruise**, *Antarctic journal of the United States*, 1992, 27(5), p.244-245, 4 refs.

During the Palmer long-term ecological research program (LTER) cruise on the R/V *Polar Duke* in mid-Nov. 1991, the authors investigated the distribution, abundance, and community composition of the zooplanktonic and nektonic community along 3 transects that each intersected the ice edge. Ice cover has been cited by various investigators as one of the primary determinants of the structure and function of the antarctic ecosystem. The data from the Nov. 1991 cruise allowed the authors to investigate the validity of this presumption for larger secondary producers during the austral spring west of the Antarctic Peninsula. Abundance and community composition of 2 dominant euphausiids were compared to observations of ice cover and to measurements of phytoplankton standing-stock determined by high-pressure liquid chromatography techniques used at the same stations by other members of the Palmer LTER.

B-51144

Fraser, W.R., Trivelpiece, W.Z., Houston, B.R., Paterson, D.R., **Palmer LTER: Seabird research undertaken during 1991-1992 at Palmer Station, Antarctic Peninsula**, *Antarctic journal of the United States*, 1992, 27(5), p.249-250, 4 refs.

The field work reported here began on Oct. 13, 1991 and ended on Mar. 7, 1992. Some preliminary results of this first LTER field season are shown in tables which compare aspects of the ecology of Adélie penguins and south polar skuas during summers following cold (1991; heavy sea ice development) and warm (1990; light sea ice development) winters. In contrast to south polar skuas, Adélie breeding success and foraging efficiency improved during the summer season following the 1991 winter. Although heavy ice during the spring after the 1991 winter delayed reproduction in skuas, breeding success was not affected, indicating that the

availability of silverfish did not change. This would suggest that approximately 8-10 years prior to the 1991 winter, sea-ice conditions were light and favored high silverfish recruitment.

B-51147

Sharp, T.R., Priscu, J.C., **Temporal variation of specific growth rates for phytoplankton in Lake Bonney, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.257-258, 11 refs.

Phytoplankton biomass (chlorophyll *a*) was measured nominally every 5 to 7 days during the 1990-1991 (Oct. 1990 to Jan. 1991) and 1991-1992 (Sep. to Dec. 1991) sampling seasons, to estimate specific growth rates of phytoplankton biomass from each of the discrete phytoplankton assemblages in Lake Bonney. Net specific growth rates for each phytoplankton assemblage were determined as the change in integrated chlorophyll over the period. Depth integration limits were 4 to 8 m, 8 to 16 m and 16 to 20 m for each of the respective assemblages. The period of maximal growth in the phytoplankton assemblages in Lake Bonney occurs after the onset of continuous daylight (around Oct. 17), similar to what Tilzer and Dubinsky (1987) hypothesized for phytoplankton in the southern oceans.

B-51148

Lizotte, M.P., Priscu, J.C., **Algal pigments as markers for stratified phytoplankton populations in Lake Bonney (dry valleys)**, *Antarctic journal of the United States*, 1992, 27(5), p.259-260, 9 refs.

Pigment profiles from Lake Bonney (east lobe), collected during the 1990-1991 field season, are discussed. Water from piezometric depths of 4 to 20 m was sampled through holes (0.25 to 1 m in diameter) in the ice cover. Profiles of chlorophyll *a* (a pigment common to all algae) and the major diagnostic accessory pigments in Lake Bonney show 3 distinct maxima. Immediately below the ice, alloxanthin coincides with chlorophyll *a*, implying that algae of the *Cryptophyceae* are dominant. This corresponds with the presence of cryptophyte-type flagellates previously identified as *Chroomonas lacustris*. At intermediate depths, the fucoxanthin peak corresponds to the presence of flagellates identified as *Ochromonas* sp, suggesting algae of the *Chrysophyceae* are dominant. The deepest peak in chlorophyll *a* (18 m) followed an increase in chlorophyll *b*, suggesting the dominance of algae of the *Chlorophyceae*. The chlorophyll *b* peak coincides with the presence of flagellates previously identified as *Chlamydomonas subcaudata*.

B-51149

Priscu, J.C., **Particulate organic matter decomposition in the water column of Lake Bonney, Taylor Valley, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.260-262, 10 refs.

Results from decomposition experiments conducted in 1990 and 1991 in the east lobe of Lake Bonney, along with corresponding phytoplankton primary productivity and chlorophyll *a* profiles, are discussed and presented in a figure. Data obtained thus far support the following conclusions: phytoplankton decomposition rates (and loss rates in general) are extremely low relative to phytoplankton production rates; heterotrophic bacterial activity below the trophic zone is extremely low (and may be absent); and bacteria below the chemocline may be dominated by chemoautotrophs (e.g., nitrifying bacteria).

B-51150

Howes, B.L., Schlezinger, D.R., Goehringer, D.D., Brown-Leger, S., **Carbon cycling in a redox-stratified antarctic lake, Lake Fryxell**, *Antarctic journal of the United States*, 1992, 27(5), p.263-265, 20 refs.

The development of a carbon balance for Lake Fryxell based upon both *in situ* and modelled rates of organic matter turnover is discussed. Aerobic respiration of the water column was determined using bottle incubations *in situ* with pulsed oxygen electrodes and in laboratory (with poisoned controls) at *in situ* temperatures using electrodes (Orbisphere) and Winkler titrations. Aerobic respiration is the dominant respiratory pathway in the central basin of Lake Fryxell. Rates varied with depth in each year, with a broad maximum extending throughout most of the euphotic zone, yielding an annual integrated rate of 2,900 mmol/m²/yr. Although this rate may be an overestimate, the *in situ* and laboratory methods

yielded similar values in both years. An unexpected finding was the apparent "gap" in carbon mineralization from 9.5-10.5 m where bacterial numbers, turbidity, and energy-charge ratios suggest the highest concentration of microbial activity. As this interval coincides with the dissolved iron and manganese maxima, the authors predict an active metal cycle associated with microbial iron (and possibly Mn) reductions at these depths.

B-51158

Decraemer, W., Noffsinger, E.M., **Revision of *Bathypsilonema* species from Antarctica described by Steiner (1931) (Nemata: Epsilonematidae)**, *Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen. Biologie*, Nov. 26, 1992, Vol.62, p.32-52, 9 refs.

A revision was made of the *Bathypsilonema* species from the German South Polar Expedition of 1901-1903 described by Steiner (1931), based upon type specimens from Steiner's collection. Two species were identified: *Bathypsilonema drygalskii* Steiner, 1931 and *B. brachycephalum* Steiner, 1931. *B. brachycephalum* is re-established as a valid species, characterized by a far anterior position of the amphideal fovea, 99-101 body annules and 42-51 micron long spicules. Both species were also found among material from the U.S. Antarctic Research Program 1969-1970, and are redescribed. (Auth.)

B-51159

Dahms, H.U., Schminke, H.K., **Sea ice inhabiting Harpacticoida (Crustacea, Copepoda) of the Weddell Sea (Antarctica)**, *Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen. Biologie*, Nov. 26, 1992, Vol.62, p.91-123, 24 refs.

Five species of harpacticoid copepods belonging to three families and 4 genera were collected from various samples of sea ice taken during 5 cruises of RV *Polarstern* to the Weddell Sea from 1985-89. One species is new and described, namely *Hastigerella antarctica* sp.n. *Drescheriella racovitzai* comb.n. (Giesbrecht, 1902), *Harpacticus furcifer* Giesbrecht, 1902 and *Idomene antarctica* (Giesbrecht, 1902) are redescribed. The fourth nauplius of an unknown representative of Ectinosomatidae is described as well as three naupliar stages of *H. furcifer*. (Auth.)

B-51160

Massin, C., **Three new species of Dendrochirotida (Holothuroidea, Echinodermata) from the Weddell Sea (Antarctica)**, *Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen. Biologie*, Nov. 26, 1992, Vol.62, p.179-191, 24 refs.

Three new species of dendrochirote holothurians are described: *Echinopsolus parvipes*, *Cucumaria acuta*, and *Trachythyone maxima*. The specimens were collected between 400 and 800 m depth in the southeast Weddell Sea. (Auth.)

B-51163

McDonald, S.J., et al, **Correlation between bioassay-derived P4501A1 induction activity and chemical analysis of clam (*Laternula elliptica*) extracts from McMurdo Sound, Antarctica**, *Chemosphere*, June 1994, 28(12), p.2237-2248, Refs. p.2245-2248.

Variable levels of halogenated aromatic hydrocarbons were measured in clams (*Laternula elliptica*) collected from McMurdo Sound. Clams collected in and near Winter Quarters Bay contained high levels of organochlorine compounds, particularly polychlorinated biphenyls (PCBs). A strong gradient has been documented in Winter Quarters Bay and has been linked to human activities at McMurdo Station. The activity of clam extracts as inducers of P4501A1-dependent ethoxyresorufin *O*-deethylase (EROD) activity was determined using *in vitro* bioassays utilizing rat hepatoma H4IIE cells. The extracts which exhibited the highest induction activities were those derived from clams collected in contaminated areas. Additionally, there was an excellent linear correlation between induced EROD activity and total PCB levels ($r^2=0.96$). The complementary nature of both the analytical and bioanalytical data confirms the utility of the latter assay and provides a method for estimating the 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxic equivalents in extracts from marine biota. (Auth.)

B-51165

Davidson, A.T., Bramich, D., Marchant, H.J., McMin, A.,
Effects of UV-B irradiation on growth and survival of antarctic marine diatoms, *Marine biology*, July 1994, 119(4), p.507-515, Refs. p.516-517.

Growth rate, survival, and stimulation of the production of UV-B (280 to 320 nm) absorbing compounds were investigated in cultures of 5 commonly occurring marine diatoms exposed to a range of UV-B irradiances. Experimental UV-B exposures ranged from 20 to 650% of the measured peak surface irradiance at an antarctic coastal site ($0.533 \text{ J/m}^2/\text{s}^1$). The 5 diatom species (*Nitzschia lecontei*, *Proboscia alata*, *P. inermis*, *Thalassiosira tumida* and *Stellarima microtrias*) appear capable of surviving two to four times this irradiance. In contrast to *Phaeocystis* cf. *pouchetii*, another major component of the antarctic phytoplankton, the concentrations of pigments with discrete UV absorption peaks in diatoms were low and did not change significantly under increasing UV-B irradiance. Absorbance of UV-B by cells from which pigments had been extracted commonly greatly exceeded that of the pigments themselves. Most of this absorbance was due to oxidizable cell contents, with the frustule providing the remainder. Survival of diatoms did not correlate with absorption by pigments, frustules or oxidizable cell contents, indicating their survival under elevated UV-B irradiances results from processes other than screening mechanisms. (Auth.)

B-51166

Zeidler, W., **New information and locality records for the antarctic amphipod *Clarencia chelata* K.H. Barnard, 1931, and a reappraisal of the family Clarenciidae J.L. Barnard & Karaman, 1987 (Amphipoda, Gammaridea)**, *Crustaceana*, Mar. 1994, 66(2), p.219-226, 10 refs.

An examination of fresh material of *Clarencia chelata* K.H. Barnard, 1931 collected from the Prydz Bay region has revealed a number of characters not recognized previously or not diagnosed correctly. New morphological information is provided and the systematic position of Clarenciidae is re-evaluated; a new superfamily Clarencioidea is proposed. A new diagnosis for Clarenciidae is also provided. The species seems to be associated with the white sponge *Asbestopluma belgicae* (Topsent, 1901) (Cladorhizidae). (Auth.)

B-51167

Pugh, P.J.A., **Non-indigenous Acari of Antarctica and the subantarctic islands**, *Linnean Society of London. Zoological journal*, Mar. 1994, 110(3), p.207-217, Refs. p.215-217.

Approximately 70 species out of a total of more than 520 Acari recorded from Antarctica and the subantarctic islands may originate from other continents, especially Australasia, South America and Europe. Although some species have probably been carried into the region on migrant birds, most may have been introduced as a result of human activity, in particular by whalers and sealers. The majority of species appear to originate from imported sheep, rabbits, rats and fowl, and a few from vegetation, soil and ship's stores. (Auth.)

B-51169

Cooper, J., Fourie, A., Klages, N.T.W., **Diet of the Whitechinned Petrel *Procellaria aequinoctialis* at sub-antarctic Marion Island**, *Marine ornithology*, 1992, 20(1/2), p.17-24, 32 refs.

The diet of Whitechinned Petrel was studied at subantarctic Marion I. in 1991. Mean meal size fed to chicks was 31 g. Fish comprised 56.6% by mass of the diet, crustaceans 23.6%, and squid 17.0%. The most abundant prey item was *Euphausia vallentini*. *Themisto gaudichaudii* occurred most frequently. Measurable prey items ranged from 14 to 288 mm in length. The squid diet of the Whitechinned Petrel suggests that scavenging is an important foraging method, although the large numbers of crustaceans in the diet at Marion I. suggest active predation. (Auth.)

B-51170

Cooper, J., Plös, A.L., **Publications and theses on antarctic and subantarctic birds, 1991**, *Marine ornithology*, 1992, 20(1/2), p.43-49, Bibliography and refs. p.43-49.

A total of 115 scientific publications and theses on antarctic and subantarctic birds for the year 1991 are listed by title. This annual list is produced by the Bird Biology Subcommittee of the Scientific Committee on Antarctic Research (SCAR) Working Group on Biology as a service to marine ornithologists. (Auth.)

B-51171

BIOMASS Working Party on Bird Ecology, **Recording distribution and abundance of seabirds at sea in the southern ocean: methods used in the BIOMASS Programme**, *Marine ornithology*, 1992, 20(1/2), p.51-59, 6 refs.

Methods used to record birds at sea during the Second International BIOMASS Experiments are described in detail, including instructions for use of record cards, such as the Voyage Master card and the Seabird record card, and the coding of seabird distributional data.

B-51172

Woehler, E.J., **Records of vagrant penguins from Tasmania**, *Marine ornithology*, 1992, 20(1/2), p.61-73, Refs. p.72-73.

The documentation of 146 observations of 9 species of penguins from 3 genera indicates that the frequency of reports of vagrant penguins to Tasmania has apparently increased since the 1970s. Four of the species breed at Macquarie I. (King, Gentoo, Royal and Rockhopper penguins), and 3 on South Island, New Zealand or cool temperate islands south of New Zealand (Fiordland, Erect Crested and Snares Crested penguins). Two species are antarctic breeding species (Adélie and Chinstrap penguins). (Auth. mod.)

B-51173

Cooper, J., **First record of the Gentoo Penguin *Pygoscelis papua* for Africa**, *Marine ornithology*, 1992, 20(1/2), p.80-81, 7 refs.

On June 28, 1992, a Gentoo Penguin was sighted swimming in the surf close to the shore of southwestern Cape, South Africa, and was captured upon coming ashore. There have been no previous records of Gentoo Penguins in Africa.

B-51174

Woehler, E.J., **Records of nonbreeding seabirds from the Australian Antarctic Territory, 1954-1988**, *Marine ornithology*, 1992, 20(1/2), p.84-90, 18 refs.

Observations of nonbreeding seabirds recorded from the Australian Antarctic Territory (AAT) between 1954 and 1988 are presented here. Data were compiled from station biology logs, field diaries and previously published records. The locations of records within the AAT are shown.

B-51175

Figueiras, F.G., Pérez, F.F., Pazos, Y., Rios, A.F., **Light and productivity of antarctic phytoplankton during austral summer in an ice edge region in the Weddell-Scotia Sea**, *Journal of plankton research*, Mar. 1994, 16(3), p.233-253, Refs. p.251-253.

The photosynthesis-irradiance relationships (P-I curves) of natural plankton samples were studied in the Weddell Sea ice-edge zone between Elephant I. and South Orkney Is. during the austral summer of 1988-89. Three water bodies were distinguished in the region: Bellingshausen Sea waters modified after flowing through Drake Passage and Bransfield Strait, Weddell Sea waters, and Weddell Sea waters modified by melting. The stations situated in modified Bellingshausen waters showed a net phytoplankton composition different from that of the other two water bodies. Weddell Sea waters and Weddell Sea waters modified by melting of sea ice had the same net phytoplankton composition. In the area of modified Weddell Sea waters, there was an accumulation of phytoplankton in the upper 40 m. The results are discussed in the context of critical depth (Z_c), net compensation irradiance (I_n) and depth of the upper mixed layer (Z_{uml}). The authors suggest that the phytoplankton in the region is adapted to maximize its carbon uptake and growth rate at the mean irradiance of the upper mixed layer (I_{uml}) in well-mixed zones. They also suggest that the light-saturation parameter (I_k) could be the irradiance at which photosynthesis approximately compensates the total losses of the community (I_n). (Auth. mod.)

B-51193

Clarke, A., **Reproductive trade-offs in caridean shrimps, *Functional ecology***, Aug. 1993, 7(4), p.411-419, 42 refs.

Volume, dry mass and nutrient content were measured in eggs from four species of polar caridean shrimp (Crustacea; Decapoda). Mean egg dry mass was positively correlated with female dry mass in all species, although this was not statistically significant in *Notocrangon*. In all species examined (*Chorismus*, *Eualus*, *Notocrangon*) there was a small but significant trade-off between egg dry mass and fecundity when the effect of female dry mass on both variables was taken into account. The reason for this trade-off is not clear, but it argues against the suggestion that there should be a minimum egg size to ensure sufficient reserves with additional resources being directed to larger eggs only when food is plentiful. There was no relation between egg dry mass and female post-spawning condition in any species once the effect of female mass had been allowed for. Data from intraspecific studies of polar shrimps and gammarid amphipods indicate that overall investment by the female (reproductive output) and investment per offspring (egg size) are not linked. Results presented here suggest that the class of reproductive ecology models that relate overall investment to investment per offspring are not appropriate for marine invertebrates. Furthermore, refinement of existing models will need to incorporate the trade-off between brood size and egg size, and co-variation of egg size with female size. (Auth. mod.)

B-51195

Michel, H.B., **Antarctic megacalanidae (Copepoda: Calanoida) and the distribution of the family, *Marine Biological Association of the United Kingdom. Journal***, 1994, 74(1-2), p.175-192, 37 refs.

The global distribution of the 12 described deep-living megacalanid species is presented in a report on collections made in the southern ocean during the United States Antarctic Research Program. Included are four species and one subspecies described in 1967 from samples obtained early in the program. In material lent to the author by the Smithsonian Oceanographic Sorting Center, only six of the described species were found. *Bathycalanus bradyi*, common in those samples and elsewhere, is made a synonym of *B. richardi*. The predominant forms are, in order, *B. richardi*, *Megacalanus princeps*, and *B. princeps*, with *Bradycalanus sarsi*, *B. typicus* and *B. gigas* also present. Knowledge of their distribution and ecology is discussed. (Auth.)

B-51196

Obst, B.S., Nagy, K.A., **Stomach oil and the energy budget of Wilson's Storm-Petrel nestlings, *Condor***, Nov. 1993, 95(4), p.792-805, 42 refs.

Wilson's Storm-Petrel chicks have energy requirements nearly double those of Leach's Storm-Petrel chicks which grow in a more temperate climate. Wilson's Storm-Petrel adults appear to meet demands of their chicks with a high frequency of meal delivery and high energy density of meals compared to those of Leach's Storm-Petrel. A comparison of the rates of energy utilization by foraging adults of the two species suggests that the high energy demands of the Wilson's Storm-Petrel chicks have selected for a foraging strategy in their adults that is expensive in terms of energy and time. Low air temperatures, a short summer season, and the presence of diurnal predators on the breeding grounds are among the factors which have shaped the chick-provisioning strategy of this species. The data further suggest that Wilson's Storm-Petrels could not breed successfully in the Antarctic without the ability to produce stomach oils. (Auth. mod.)

B-51197

Huntley, M.E., Zhou, M., Lopez, M.D.G., ***Calanoides acutus* in Gerlache Strait, Antarctica II. Solving an inverse problem in population dynamics, *Deep sea research, Part II. Topical studies in oceanography***, Jan. 1994, 41(1), U.S. GLOBEC: Global Ocean Ecosystems Dynamics, edited by J.E. Eckman, p.209-227, 29 refs. For Part I of this set see 21B-49435.

A population dynamics model of the overwintering southern ocean copepod *Calanoides acutus* was constructed based on field observations of abundance in the Gerlache Strait during Nov. 1989. An analytical solution was used to solve an inverse problem to determine rates of stage-specific mortality and development as the population emerged from overwintering diapause. Model predictions of mortality rates for CIV, CV and CVI

copepodites were 0.068, 0 and 0.131/day, respectively. Best fit solutions of the model predict that late-stage copepodites emerge from diapause by "pulse moulting;" overwintering copepodites appear to emerge from diapause *en masse* in a relatively brief period prior to the annual spring bloom, rather than moulting at the comparatively slow rates observed in summer. It is suggested that the modelling approach used may have application to many species of copepods whose populations overwinter. (Auth.)

B-51200

Czaker, R., ***Kantharella antarctica*, a new and unusual dicyemid mesozoan from the Antarctic, *Zoologischer Anzeiger***, Mar. 1994, 232(3/4), p.151-158, 10 refs.

The light microscopical and fine structural features of a new dicyemid mesozoan from the antarctic differ remarkably from the generally accepted organization of this group because of (1) their varying numbers of cells instead of cell constancy, (2) their varying types of reproductive cells in the nematogens instead of only axoblasts and (3) the infection with a previously unknown microsporidium (i.e. hyperparasitism). (Auth.)

B-51202

McClintock, J.B., et al, **Chemotactic tube-foot responses of a spongivorous sea star *Perknaster fuscus* to organic extracts from antarctic sponges, *Journal of chemical ecology***, Apr. 1994, 20(4), p.859-870, 45 refs.

Hexane, chloroform, and methanol extracts of 18 species of antarctic sponges were tested for their ability to induce sustained tube-foot retraction in the antarctic spongivorous sea star *Perknaster fuscus*. Extracts were imbedded in silicone and used to coat the tip of a glass rod, which was allowed to contact an extended tube-foot. Retraction times were measured and compared with three controls: contact with a glass rod coated with a hexane extract of fish (feeding stimulant), contact with the glass rod alone (mechanical control), and contact with the glass rod coated with silicone alone (silicone control). Only extracts of the sponge *Mycale acerata* did not elicit significantly longer tube-foot retraction times than controls for at least one of the three organic extracts. Hexane sponge extracts elicited the lowest levels of significant tube-foot responses, with only 39% of the sponge species tested showing activity in this fraction. In contrast, chloroform and methanol extracts elicited a significant tube-foot retraction response in 73% and 78% of the species tested, respectively. It may be of ecological significance that the two rapidly growing sponges, *Homaxinella balfourensis* and *M. acerata*, were either not repellent or had low repellency, and that *M. acerata* is the primary dietary item of *P. fuscus*. (Auth. mod.)

B-51209

Miceli, C., et al, **Identification of the tubulin gene family and sequence determination of one beta-tubulin gene in a cold-poikilotherm protozoan, the antarctic ciliate *Euplotes focardii*, *Journal of eukaryotic microbiology***, July-Aug. 1994, 41(4), p.420-427, Refs. p.426-427.

Four different tubulin genes were identified in the somatic nucleus (macronucleus) of *Euplotes focardii*, a strictly cold-adapted antarctic ciliate: one of 1,800 bp for *alpha*-tubulin and three of 2,150, 1,900 and 1,600 bp, respectively, for B-tubulin. Preliminarily analyzed for restriction fragment length polymorphisms, these genes showed remarkable differences in organization from tubulin genes of other ciliates which live in temperate areas and were analyzed in parallel with *E. focardii*. The complete coding sequence of the 1,600 bp B-tubulin gene was then determined and shown to contain unique structural features of potential importance for *E. focardii* microtubule organization and activity. Of eight unique substitutions detected, seven were concentrated in the large amino terminal domain of the molecule that directly interacts with the carboxy terminal region of *alpha*-tubulin for heterodimer formation. Sequence analysis of the cloned gene revealed, in addition, a potential new exception in the use of the genetic code by ciliates. A TAG codon was aligned in correspondence with Trp-21 which is strictly conserved in every tubulin sequence so far determined. (Auth.)

B-51216

Miller, W.R., Heatwole, H., Pidgeon, R.W.J., Gardiner, G.R., **Tardigrades of the Australian Antarctic Territories: the Larse-**

mann Hills, East Antarctica, American Microscopical Society. Transactions, Apr. 1994, 113(2), p.142-160, Refs. p.158-160.

A survey of the terrestrial tardigrades inhabiting algae, lichens, and mosses in the Larsemann Hills was conducted at 61 sites during the austral summer of 1987. Five genera and six species of Tardigrada were recovered. Statistical analysis of biotic association was conducted; for most species-pairs, tardigrades occur randomly with respect to each other. The hypothesis is proposed that distribution of tardigrades in the Antarctic is more strongly influenced by dispersal capabilities than by climatic factors or biotic interactions. (Auth.)

B-51222

Di Prisco, G., **Environmental adaptation in polar sea vertebrates** [Adattamenti ambientali nei vertebrati dei mari polari], Italy. Consiglio Nazionale delle Ricerche. Direzione Centrale Attività Scientifiche. Commissione Scientifica Polare. Atti del Seminario su "Il ruolo delle aree remote nello studio dei cambiamenti globali" (Role of remote areas in the study of global changes. Seminar proceedings), Rome, 1993, p.111-115, In Italian with English summary.

The consequences of global change on living systems, in particular the effects of increased UVB due to ozone depletion, stress the importance of studying this phenomenon in remote areas such as the polar seas. Physiological and biochemical specializations of fish living in isolation in the antarctic oceans indicate that evolutionary adaptation to extreme environmental conditions produces a much narrower ecological tolerance than ecosystems of lower latitudes. Consequently, the new adaptive strategies aimed at repairing the genetic damage caused by climatic changes will be more dramatic and go into effect more readily. (Auth. mod.)

B-51223

Bisol, P.M., **Genetic differentiation and environmental factors in antarctic and subantarctic marine invertebrates** [Differenziamento genetico e fattori ambientali in invertebrati di aree antartiche e subantartiche], Italy. Consiglio Nazionale delle Ricerche. Direzione Centrale Attività Scientifiche. Commissione Scientifica Polare. Atti del Seminario su "Il ruolo delle aree remote nello studio dei cambiamenti globali" (Role of remote areas in the study of global changes. Seminar proceedings), Rome, 1993, p.115-117, In Italian with English summary. 12 refs.

This paper emphasizes the evolutionary approach in modern environmental studies to evaluate the biological responses to environmental stresses. Comparative studies on organisms from challenging ecosystems, such as in the polar areas, may facilitate understanding of differential adaptive mechanisms related to speciation events. The biological effects of constant low temperatures and the long isolation of Antarctica may be revealed by the study of organisms distributed in subantarctic regions. Highlights of data obtained regarding amphipods belonging to the genus *Paramoera* (Crustacea) are presented. The geographic and microgeographic differentiations of populations collected from antarctic and South American localities are suggested by the complexity of the dendrogram of genetic distance generated by the UPGMA method. (Auth.)

B-51226

Lunn, N.J., Boyd, I.L., **Influence of maternal characteristics and environmental variation on reproduction in antarctic fur seals**, Symposia of the Zoological Society of London, No.66 and Marine mammals: advances in behavioural and population biology, edited by I.L. Boyd, Oxford, Clarendon Press, 1993, p.115-129, Refs. p.128-129.

DLC QL1.Z733

Antarctic fur seals breed synchronously in a highly seasonal environment. There is considerable inter-annual variation in food supply, which affects breeding performance. However, food supply may also influence future performance through effects on female ovulation, implantation and/or pregnancy. The authors used foraging trip duration, pup growth rate and weaning mass as indicators of the food available to females during the pup-rearing period (Dec.-Apr.), and examined relationships between these and pup production and timing of breeding in the following year. The results are consistent with the hypothesis that poor feeding conditions, indicated by slow pup growth and long foraging trips, lead to lower pro-

duction and delayed pupping the following year. It is suggested that these effects result from females being in poorer condition in years of food shortage, so that fewer of them implant (or more abort) and implantation is delayed. (Auth. mod.)

B-51230

Viot, C.R., Jouventin, P., Bried, J., **Population genetics of southern seabirds**, *Marine ornithology*, 1993, 21(1/2), p.1-25, Refs. p.16-19.

Results are provided of a population genetics study using the starch gel electrophoresis technique and concerning 22 species of seabirds from four localities of the southern ocean: Adélie Coast and Crozet, Kerguelen and Amsterdam Is. Concerning genetic differentiation, species classification is reviewed using data from electrophoresis: for example, populations of King Penguins from Kerguelen and Crozet Is. show a high level of isolation. For five species, electrophoretic data are compared with the preliminary results of a mitochondrial DNA study. At a higher taxonomic level, storm petrels Hydrobatidae are markedly distant from the other three families of Procellariiformes. Concerning heterozygosity, genetic variability is low in the Wandering Albatross, low on average for seabirds in general, and increases on average towards higher latitudes. (Auth.)

B-51231

Norman, F.I., Ward, S.J., **Foraging group size and dive duration of Adélie Penguins *Pygoscelis adeliae* at sea off Hop Island, Rauer Group, East Antarctica**, *Marine ornithology*, 1993, 21(1/2), p.37-47, Refs. p.46-47.

Adélie penguins were observed off Hop I. during the 1990-91 summer. Group sizes were established, and birds classified into those showing feeding or traveling behaviors. Most (71.3%) of the 797 groups recorded were of one to three birds (38.7% of the 2460 recorded) and only 2.8% of the groups exceeded 10 penguins. Group sizes of those feeding were significantly smaller than those not foraging. There were significant differences between group sizes throughout the day, and throughout the study period which extended from late incubation into late guard stages. Recorded dive durations varied considerably, with some birds apparently foraging underwater for over 350 s, although most dives (90%) were for 230 s or less. There were differences in dive duration with time of day. Data are compared with information on group size and dive duration in other penguins. There appears to be no current evidence of cooperative feeding in large groups; foraging singly or in small numbers is routine and may reduce exposure to predators. Dive durations recorded here are extensive, but within predicted anaerobic capabilities. (Auth. mod.)

B-51232

Van den Hoff, J., Kirkwood, R.J., Copley, P.B., **Aspects of the breeding cycle of King Penguins *Aptenodytes patagonicus* at Heard Island**, *Marine ornithology*, 1993, 21(1/2), p.49-55, 12 refs.

An exponentially increasing population of King Penguins breeds at seven known colonies on Heard I. During the 1987-88 summer, breeding activities were closely monitored at one colony. Egg laying commenced in mid-Nov. and ceased three months later in mid-Feb. Whole-island egg production for the season was estimated at 4232, with 85% laid at the Doppler Hill colony. Three distinct laying periods were noted: Nov. 18 to Dec. 18 (44% of eggs laid), Dec. 23 to Jan. 17 (44% of eggs laid) and Jan. 25 to mid-Feb. (12% of eggs laid). Ten percent of the eggs laid had perished by early Mar. Of the previous season's (1986-87) eggs, 1672 chicks survived the 1987 winter. At the larger colonies, over-winter survival was variable between 56 and 72% of the eggs laid. (Auth.)

B-51233

Thompson, K.R., **Variation in Magellanic Penguin *Spheniscus magellanicus* diet in the Falkland Islands**, *Marine ornithology*, 1993, 21(1/2), p.57-67, 21 refs.

Magellanic penguins breed at over 90 locations in the Falkland Is. The breeding season diet includes small fish (principally nototheniids, immature Southern Blue Whiting and sprats), the decapod crustacean lobster krill, and small squid (predominantly *Gonatus antarcticus*). However, simultaneous investigation of diets at two colonies 60 km apart indicates considerable variation between sites in the gross composition of the diet.

The diet also varies both seasonally and between years at individual sites. The implications of these findings for chick growth, marine ecosystems modelling and conservation are considered. (Auth.)

B-51234
Orgeira, J.L., Recabarren, P., **Ornithological observations at Belgrano II Station, Filchner Ice Shelf, Antarctica**, *Marine ornithology*, 1993, 21(1/2), p.74-77, 7 refs.

Observations of seabirds were made at Belgrano II Station on the Filchner Ice Shelf during the austral spring of 1985 and in the late spring and summer of 1990. The station was built on the Bertrab Nunatak, which is about 170 m long and 140 m wide, 5 km from the coast; the Littlewood Nunataks are 10 km northeast. Two ice-free rock promontories constitute the Bertrab Nunatak; the larger supports the station. This paper describes the avifauna of the Bertrab and Littlewood Nunataks for the first time.

B-51235
Scientific Committee on Antarctic Research, Working Group on Biology, Bird Biology Subcommittee, **Minutes of meeting, 7-8 June 1992, Bariloche, Argentina**, *Marine ornithology*, 1993, 21(1/2), p.79-104, Refs. p.96-98.

The Bird Biology Subcommittee ranged over a broad band of territory in the southern ocean while considering reports on a wide variety of topics, including banding, publications, seabird populations/distributions, giant petrels, CCAMLR ecosystem monitoring program (CEMP), plastic pollutants, BIOMASS investigations, seabirds-at-sea data, and seabird research at the South Shetland Is. Recommendations to SCAR via the Working Group on Biology are listed.

B-51237
Osumi, S., **Japanese scientific whaling in the antarctic ocean**, *Polar news*, Mar. 1994, No.58, p.11-13, In Japanese.

Japan's scientific whaling program, particularly of the minke whale, is summarized. There are two main objectives: the first is to determine the biological characteristics required for resource management, such as by estimating the age distribution of randomly collected individuals; and the second objective is to determine the role of the whale in the ecosystem, such as by studying its stomach contents. A fund of about 1.4 billion yen in donations has been reserved at the beginning of the program and the Japanese government will appropriate about 500 million yen a year.

B-51240
Aoyagi, M., **Penguins in the Antarctic Peninsula**, *Polar news*, Mar. 1994, No.58, p.31-35, In Japanese.

There are generally considered to be 16, 17, or 18 species and perhaps 6 subspecies of penguin worldwide, with some question as to what constitutes a species and what a subspecies. Though the penguin populations of Antarctica are fluctuating, they appear to be stable and in many cases even increasing. According to recent censuses of gentoo, Adélie, chinstrap, and macaroni penguins, for the gentoo, there were 20,000 pairs at 60-70 sites on the Antarctic Peninsula and 20,000-24,000 individuals at 25 sites on the South Shetland Is. for a total of 60,000-64,000 individuals; for the Adélie, there were 375,200 individuals at 42 sites on the Antarctic Peninsula and 60,000 individuals at 5 sites on the South Shetland Is. for a total of 435,200 individuals; for the chinstrap, there were 110,000 individuals at 56 sites on the Antarctic Peninsula and 2,068,600 individuals at 11 sites on the South Shetland Is. for a total of 2,178,600 individuals; and for the macaroni, there was one pair at a colony on the Antarctic Peninsula and 352 individuals at 4 sites on the South Shetland Is. for a total of 354 individuals.

B-51246
Meurk, C.D., et al, **Ion-rich precipitation and vegetation pattern on subantarctic Campbell Island**, *Arctic and alpine research*, Aug. 1994, 26(3), p.281-289, 34 refs.

Campbell I., situated in the middle of the belt of southern ocean gales, experiences a mean windspeed above that at which sea spray forms. Ionic concentration and related parameters were measured in precipitation collected throughout a year along a transect of rain gauges extending inland from the windward, westerly coast and up to the highest point on the island (558 m). Concentrations decreased logarithmically away from the coast and varied between seasons. Seasonal variation was correlated with the frequency of gales. The calculated annual input of ions ranged from 2507

kg/ha/yr Na at 50 m from the windward coast to 187 kg/ha/yr Na at 5500 m from the windward coast. The high values are related to the exposure of the collection points and to the latitude, and hence climate, of Campbell I. Marked spatial variations in ionic input have a controlling influence on floristic structure and productivity patterns of subantarctic vegetation. This is consistent with the dominance of the maritime factor in explaining the primary axes of vegetation ordination. (Auth. mod.)

B-51247
Fowbert, J.A., Smith, R.I.L., **Rapid population increases in native vascular plants in the Argentine Islands, Antarctic Peninsula**, *Arctic and alpine research*, Aug. 1994, 26(3), p.290-296, 37 refs.

The number of individual plants and colonies of the two native antarctic vascular plants *Colobanthus quitensis* and *Deschampsia antarctica* have been monitored between 1964 and 1990 on three islands in the Argentine Is. archipelago, western Antarctic Peninsula. The *Deschampsia* population increased by nearly 25-fold and *Colobanthus* by over 5-fold. Furthermore there was a considerable increase in the number of *Deschampsia* colonies, although no additional colonies of *Colobanthus* were recorded. An analysis of *Colobanthus* plant size in 1974 and 1990 indicated that recruitment was probably irregular although the population structure remained essentially the same. The reasons for this and the increases in population size of both species are discussed. The relatively rapid increase in the abundance and distribution of these species is considered to be a response to the increasing summer air temperatures being experienced in this region of the maritime Antarctic. In particular, there is probably improved success in reproductive behavior resulting from warmer and/or longer growing seasons. (Auth. mod.)

B-51248
Vincent, W.F., Roy, S., **Solar ultraviolet-B radiation and aquatic primary production: damage, protection, and recovery**, *Environmental reviews*, 1993, 1(1), p.1-12, Refs. p.9-12.

The continuing degradation of the Earth's ozone layer by atmospheric pollutants has generated concern about the impact of increased solar ultraviolet-B radiation (UV-B) on aquatic ecosystems. UV-B is a small (less than 1% of total energy) but highly active component of the solar spectrum that can penetrate to biologically significant depths in lakes and oceans. Algal and cyanobacterial cells have four lines of defence against the toxic effects of UV-B. Some species avoid UV exposure by their choice of habitat or by migration strategies. Many species produce sunscreens pigments that filter out UV wavelengths; mycosporine-like amino acids are an especially important and ubiquitous class of such compounds. Most cells have a variety of defenses against the toxic end products of UV radiation, such as radical scavenging by carotenoid pigments and superoxide dismutase. Finally, most cells have at least some ability to identify and repair the UV damage of DNA and other biomolecules. There is a large interspecific variability in the extent of each of these defence strategies. Continuing ozone depletion is not likely to cause an abrupt collapse of photosynthetic production, but may result in subtle, community-level responses that could ultimately impact on higher trophic levels. (Auth. mod.)

B-51252
Sokolova, M.N., **Euphausiid “dead body rain” as a source of food for abyssal benthos**, *Deep-sea research*, Apr. 1994, 41(4), p.741-746.

Ophiuroids trawled from the deep seabed at depths between 3100 and 6420 m in the Argentine Basin, the Scotia and Weddell Seas and the Orkney Trench were dissected to analyze their stomach contents. In the southern stations, the euphausiid “dead body rain” constituted the most important diet of the ophiuroids in some of the localities investigated. (Auth.)

B-51253
Graeve, M., Hagen, W., Kattner, G., **Herbivorous or omnivorous? On the significance of lipid compositions as trophic markers in antarctic copepods**, *Deep-sea research*, May/June 1994, 41(5/6), p.915-924, Refs. p.922-924.

Three dominant antarctic copepods, *Calanoides acutus*, *Rhincalanus gigas* and *Metridia gerlachei* (copepodite stages V and females), were collected during summer in the southern Weddell Sea. Detailed analyses of

their lipid and fatty acid/alcohol compositions were carried out. The trophic positions of these copepods were elucidated by means of the lipid compositions ("marker lipids"). High amounts of wax esters were found in *C. acutus* (92% of total lipids) and in *R. gigas* (84-86%). The level of wax esters in *M. gerlachei* was relatively low (27-42%), while the accumulation of triacylglycerols tended to be higher (19-22%). Characteristic lipid components of *C. acutus* were the long-chain monounsaturated fatty acids and fatty alcohols 20:1 (n-9) and 22:1 (n-11). These components together with elevated amounts of the 18:4 (n-3) and, to a lesser degree, of the 16:1 (n-7) fatty acids typical of phytoplankton lipids indicate herbivorous feeding for *C. acutus*. The fatty acid composition of *M. gerlachei* was characterized by very high amounts of these 22:6 and 20:5 acids. In contrast to *C. acutus*, the fatty alcohols of *M. gerlachei* consisted almost exclusively of the short-chain components 14:0 and 16:0. *M. gerlachei* is known as an omnivorous species, which was clearly reflected by its lipid and fatty acid/alcohol pattern. *R. gigas* showed fatty acid/alcohol characteristics typical of either *C. acutus* or *M. gerlachei*. The lipid composition of *R. gigas* showed an intermediate pattern, which implies a tendency towards an opportunistic feeding mode, positioned somewhere between the other two species. (Auth. mod.)

B-51254

Boyd, I.L., Arnould, J.P.Y., Barton, T., Croxall, J.P., **Foraging behaviour of antarctic fur seals during periods of contrasting prey abundance**, *Journal of animal ecology*, July 1994, 63(3), p.703-713, 35 refs.

Foraging behavior of antarctic fur seals rearing pups at Bird I., South Georgia, was assessed using at-sea activity patterns measured by electronic time-depth recorders. Information was obtained for a total of 75 individuals and 191 foraging trips to sea over 5 reproductive seasons from 1988/89 to 1992/93; this included one season (1990/91) of low prey abundance. A method was developed to divide the diving record into logical units or bouts which differed from past methods used for defining bouts of behavior. Foraging trips were significantly longer in 1990/91 than in the other years. There were significant differences between years in the proportion of time spent foraging when at sea and in the distribution of foraging through the day and night. These differences probably represent behavioral responses to changes in prey distribution and abundance and were reflected in the frequency of occurrence of different types of foraging behavior. Four types of foraging bouts were recognized using a cluster analysis. The study demonstrated that female fur seals invest a significantly greater effort in foraging during periods of low prey abundance by both increasing the time spent foraging and increased activity during foraging. (Auth. mod.)

B-51255

Malcolm, H.M., et al, **Trace metals in antarctic fur seal (*Arctocephalus gazella*) livers from Bird Island, South Georgia**, *Marine pollution bulletin*, June 1994, 28(6), p.375-380, Refs. p.379-380.

Samples of liver from 11 female antarctic fur seals (*Arctocephalus gazella*) from Bird I., South Georgia were analyzed for 16 trace elements. The mean concentration for each element (mg/kg dr wt) was Mg, 727; Cr, 1; Cu, 263; Zn, 384; Rb, 7; Sr, 0.3; Mo, 1; Cd, 350; Hg, 215; Pb, 0.1. Levels of Co, Sn, I, Ba, La, and Ce were below the detection threshold. For the majority of elements, the measured concentrations were considerably higher than concentrations previously reported in seals. Significant Spearman correlation coefficients were obtained between Cd and Hg, Cd and Zn, Hg and Zn, Sr and Mo, age and Cd, and age and Hg. The toxicological significance of these concentrations is discussed. (Auth.)

B-51256

Billger, M., Wallin, M., Williams, R.C., Jr., Detrich, H.W., III, **Dynamic instability of microtubules from cold-living fishes**, *Cell motility and the cytoskeleton*, 1994, 28(4), p.327-332, Refs. p.331-332.

The dynamic instability of microtubules free of microtubule-associated proteins from two genera of cold-living fishes was measured, by means of video-enhanced differential-interference-contrast microscopy, at temperatures near those of their habitats. Brain microtubules were isolated from the boreal Atlantic cod (*Gadus morhua*; habitat temperature about 2-15°C) and from two austral antarctic rockcods (*Notothenia gibberifrons* and *N. coriiceps neglecta*; habitat temperature about -1.8 to +2°C).

Critical concentrations for polymerization of the fish tubulins were in the neighborhood of 1 mg/ml, consistent with high interdimer affinities. Rates of elongation and frequencies of growth-to-shortening transitions ("catastrophes") for fish microtubules were significantly smaller than those for mammalian microtubules. Slow dynamics is therefore an intrinsic property of these fish tubulins, presumably reflecting their adaptation to low temperatures. Two-dimensional electrophoresis showed striking differences between the isoform compositions of the cod and the rockcod tubulins, which suggests that the cold-adapted microtubule phenotypes of northern and southern fishes may have arisen independently. (Auth.)

B-51288

Arrigo, K.R., McClain, C.R., **Spring phytoplankton production in the western Ross Sea**, *Science*, Oct. 14, 1994, 266(5183), p.261-263, 20 refs.

Coastal zone color scanner (CZCS) imagery of the western Ross Sea revealed the presence of an intense phytoplankton bloom covering >106,000 sq km in early Dec. 1978. This bloom developed inside the Ross Sea polynya, within 2 weeks of initial polynya formation in late Nov. Primary productivity calculated from Dec. imagery (3.9 grams of carbon/sq m/day) was up to four times the values measured during *in situ* studies in mid-Jan. to Feb. 1979. Inclusion of this early season production yields a spring-to-summer estimate of 141 to 171 grams of carbon/sq m, three to four times the values previously reported for the western Ross Sea. (Auth.)

B-51292

Harris, C.M., **Standardisation of zones within specially protected and managed areas under the Antarctic Environmental Protocol**, *Polar record*, Oct. 1994, 30(175), p.283-286, 12 refs.

A number of countries are revising management plans for protected areas in Antarctica so that they comply with Annex V to the Protocol on Environmental Protection to the Antarctic Treaty. Annex V allows for 'identification of zones...in which activities are to be prohibited, restricted or managed.' A wide range of terms is, and could be, used to meet site-specific zoning needs. If allowed to develop in an *ad hoc* way, a confusing and inconsistent set of zones would be likely to evolve. This could be avoided by a coordinated and pro-active approach to identifying the zones needed. Based on field observations and examination of current and proposed management plans, a simple, standardized model of five types of zone is proposed: Restricted, Scientific, Tourist, Facilities, and Historic. Their application, where needed, would meet the full range of management needs within specially protected and managed areas in Antarctica. (Auth.)

B-51295

Cruwys, E., Davis, P.B., **Southern elephant seal numbers during moult on Livingston Island, South Shetland Islands**, *Polar record*, Oct. 1994, 30(175), p.313-314, 4 refs.

Southern elephant seals were counted daily between Jan. 2 and Feb. 16, 1994 along the entire length of Hannah Point beach. The count was taken between 8AM and 10AM by three independent observers. The sex of the animals and whether they were adult, sub-adult, or juvenile were also noted. Results show a drop from 339 seals counted on Jan. 2 to 90 seals counted on Feb. 16, 1994; they were predominantly juvenile or sub-adult males. Only 3 adult females were positively identified during the seven-week period, and they were hauled out alone and some distance from the male wallows. No adult males were seen. The austral summer of 1993-94 saw some unusual climatic conditions in the Antarctic. Heavy sea ice was recorded at Signy I. late in the season, with lower than expected air temperatures. At Hannah Point, more storms and higher wind speeds were noted than in previous seasons. Temperatures during the counts of seals ranged from -2 to 8°C, but were consistently at the lower end of the range after Jan. 20. It is possible that these lower temperatures and unusual climatic conditions were responsible, at least in part, for the low numbers of adult female elephant seals recorded at Hannah Point. However, it would be necessary to assess the population structure during subsequent years before any reliable conclusions could be drawn.

B-51308

Winkler, H., **Characterization of the Scotia Arc isopod fauna (Crustacea, Malacostraca) from a biogeographical point of view: a multivariate approach** [Charakterisierung der Isopoden-

fauna (Crustacea, Malacostraca) des Scotia-Bogens aus biogeographischer Sicht: ein multivariater Ansatz], *Berichte zur Polarforschung*, 1994, No. 139, 196p., In German with English summary. Refs. p.156-176.

The theory of multivariate methods in historical biogeography is discussed and the zoogeography of the Isopoda of the Scotia Ridge system is analyzed. The shelf isopod fauna of the Antarctic can be distinguished from that of the Subantarctic primary areas on all taxonomic levels. This leads to the assumption that the antarctic fauna consists of many Gondwanian elements. The homogeneous distribution pattern of the Scotia Arc shelf isopods on the family level indicates a common history of the taxa in question. On the levels of genera and species this fauna is separated into a Magellanic and a Scotian Arc group. The highest number of genera of the investigated region was found near the Scotia Arc including southern South America; most of them are cosmopolitan. The large-scale distribution pattern suggests that species of these genera have a high tolerance to ecological and physical factors; they have the ability to live in different environments, as the antarctic or South American shelf. Other Scotia Arc taxa (Nannoniscidae) are of northern origin, i.e. the Tethys Sea. Such groups radiated outside tropical regions (e.g., the "Janiridae"); their dispersal was limited by the extreme environmental conditions in Antarctica. (Auth. mod.)

B-51313

Sai Ram, M., Singh, L., Alam, S.I., Aggarwal, M.K., **Extracellular protease from *Bacillus coagulans*, a psychrotrophic, antarctic bacterium**, *World journal of microbiology & biotechnology*, May 1994, 10(3), p.356-357, 2 refs.

During studies on extracellular enzyme production by psychrotrophs, *Bacillus coagulans*, from an antarctic soil isolate (collected by the National Institute of Oceanography, India) produced an extracellular protease and a cell-bound amylase. The nature of the protease and its regulation in *B. coagulans* are reported. (Auth.)

B-51315

Tiefenbacher, L., **Decapod Crustacea of western antarctic waters collected by the R.V. *John Biscoe*, Cruise 11** [Decapode Crustaceen aus westantarktischen Gewässern gesammelt von der R.V. *John Biscoe*, Reise 11], *Spixiana*, Mar. 1994, 17(1), p.13-19, In German with English summary. 22 refs.

During Jan.-Feb. 1991 scientists aboard the R/V *John Biscoe* sampled the waters in the Drake Passage and northwest of South Georgia, south of the Antarctic Polar Front (APF) using a closing midwater trawl (RMT 25=Rectangular-Midwater-Trawl). From samples, six species of Natantia (*Acantheephyra pelagica* (Risso, 1816); *Pasiphaea grandicula* Burukovsky, 1976; *Pasiphaea scotiae* (Stebbing, 1914); *Gennadas kempi* Stebbing, 1914; *Petalidium foliaceum* Bate, 1881; *Sergestes arcticus* (Kroeyer, 1858) and one species of Reptantia (*Stereomastis suhmi* Bate, 1878) are reported. The specimens of *P. grandicula* and *S. arcticus* are the first records of these species in the western antarctic region. The five *Eryoneicus* stages of *S. suhmi* represent the second record after the description of the single specimen by Calman (1925), and the second species of Reptantia which is known from antarctic waters. (Auth.)

B-51317

Grossmann, S., **Bacterial activity in sea ice and open water of the Weddell Sea, Antarctica: a microautoradiographic study**, *Microbial ecology*, July-Aug. 1994, 28(1), p.1-18, 53 refs.

Relation of [³H]leucine incorporation to the biomass of active bacteria provides information about changes of specific metabolic activity of cells. During a phytoplankton bloom in an ice-free, stratified water column, total numbers of bacteria in the euphotic zone averaged 2.3 x 10⁵/ml, but only about 13% showed activity via leucine uptake. When sea ice was forming in high concentrations of phytoplankton, bacterial biomass in the newly formed ice was 49.1 ng C/ml, exceeding that in open water by about one order of magnitude. Attachment of large bacteria to algal cells seems to cause their enrichment in the new ice, since specific bacterial activity was reduced during ice formation, and enrichment of bacteria was not observed when ice formed at low algal concentration. During growth of pack ice, biomass of bacteria increased within the brine channel system. Specific activity was still reduced at these later stages of ice development, and percentages of active cells were as low as 3-5%. In old, thick pack ice,

bacterial activity was high and about 30% of cells were active. However, biomass-specific activity of bacteria remained significantly lower than that in open water. It is concluded that bacterial assemblages different from those of open water developed within the ice and were dominated by bacteria with lower average metabolic activity than those of ice-free water. (Auth. mod.)

B-51318

Mühlenhardt-Siegel, U., ***Leucon parasiphonatus*, a new species (Crustacea: Cumacea: Leuconidae) from antarctic waters**, *Helgoländer Meeresuntersuchungen*, 1994, 48(1), p.79-88, 8 refs.

Six specimens of *Leucon parasiphonatus* n.sp. were collected at depths ranging from 15 to 424 m in the vicinity of King George I. and the southeastern Weddell Sea. *L. parasiphonatus* belongs to the subgenus *Leucon*, and differs from the other already known antarctic and subantarctic species of the genus by the absence of a serrated dorsomedian line and by the presence of a long pseudorostrum with several fine setae at its tip, surrounding the very long branchial siphon. The surface of the carapace is granulated; the carapace displays no teeth except for a few at its antero-lateral margin and at its ventral margin. The species most similar to *L. parasiphonatus* is *L. siphonatus*, reported from Mediterranean and North Atlantic waters. (Auth.)

B-51319

Jesús Vázquez, M., et al, **Antarctic marine metabolites: new polyhydroxylated steroidal glycosides from the starfish *Odontaster validus***, *Liebigs Annalen der Chemie*, Dec. 1993, 1993(12), p.1257-1262, 19 refs.

Two new asterosaponins, validosides A and B, were isolated from the butanolic extract of the starfish *Odontaster validus* and their structures established on the basis of extensive spectroscopic investigations and chemical correlations. Validoside A and B are extremely rarely occurring saponins due to the presence of a sulfated group at two locations in the structural diagram. The absolute configuration at C-24 was S by the application of the Trost-Mosher methodology. (Auth. mod.)

B-51321

Valbonesi, A., Raikov, I., **Unusual structure of the macronucleus in two antarctic marine species of *Euplotes***, *European journal of protistology*, May 27, 1994, 30(2), p.184-190, 32 refs.

Intramacronuclear inclusions, apparently of proteinaceous nature and of the "sphere" type, have been detected in two species of *Euplotes*, *E. focardii* and *E. nobilii*, collected from the marine benthos of the Ross Sea and reproducing in the laboratory at 4 C. In *E. focardii*, they are up to 5 microns in diameter and arranged medially along the macronucleus, while in *E. nobilii* they are smaller and arranged more randomly. Associated with these inclusions there are normal chromatin bodies, but no apparent nucleoli. It was suggested that these inclusions essentially consist of protein moieties of modified nucleoli which are depleted of most (or all) RNA, or contain dispersed, yet functional, RNA areas. (Auth.)

B-51322

Melick, D.R., Seppelt, R.D., **Effect of hydration on carbohydrate levels, pigment content and freezing point of *Umbilicaria decussata* at a continental antarctic locality**, *Cryptogamic botany*, June 20, 1994, 4(2), p.212-217, 28 refs.

Thalli of *Umbilicaria decussata* from various moisture regimes in the Windmill Is. region were sampled during Feb. 1992. Thallus moisture content varied between 10 and 246% by weight. Analyses by gas-liquid chromatography (GLC) revealed no significant differences in the total levels of low molecular weight carbohydrates. However, the proportion of algal products (ribitol) relative to fungal products (arabitol and mannitol) was greater in specimens collected from the wet habitat. Resaturation of lichen thalli from dry habitats resulted in a loss of up to 5% of the total soluble carbohydrate pool, but leaching losses from soaking of wet thalli were negligible. There were no significant differences in the pigment levels in the variously hydrated lichens, suggesting phycobiont levels were consistent between samples. Freezing points of tissue were slightly elevated in the most hydrated specimens. The results of these studies are discussed in relation to studies of the photosynthetic physiology of lichens in Antarctica. (Auth.)

B-51323

Schroeter, B., Green, T.G.A., Kappen, L., Seppelt, R.D., **Carbon dioxide exchange at subzero temperatures. Field measurements on *Umbilicaria aprina* in Antarctica**, *Cryptogamic botany*, June 1994, 4(2), p.233-241, 44 refs.

Field measurements of CO₂ exchange were made on *Umbilicaria aprina* at Granite Harbour, southern Victoria Land using an infrared gas analyzer system. Net photosynthetic activity was detected at subzero temperatures down to -17 C, whereas dark respiration ceased at temperatures below -10 C. The marked depression of net photosynthetic rates at temperatures below -3 C may be due to an increase in thallus diffusion resistance because of the presence of ice in the thallus below that temperature. However, it is suggested that a more likely explanation is the dehydration following extracellular ice formation. The lichens then behave as if they are in equilibrium with atmospheric humidity. It is suggested that this would explain the relative scarcity of cyanobacterial lichens in continental Antarctica. However, significant rates of net photosynthesis at subzero temperatures indicate that periods other than the peak summer season can be productive for lichens on the antarctic continent. (Auth. mod.)

B-51398

Kennicutt, M.C., II, McDonald, S.J., Sweet, S.T., **Bahia Paraiso spill in Arthur Harbor, Anvers Island**, *Antarctic journal of the United States*, 1992, 27(5), p.331-333, 4 refs.

The *Bahia Paraiso* ran aground on Jan. 28, 1989, approximately 2 km from Palmer Station. The first evidence of ecological damage was observed in the intertidal zone. Invertebrate mortality, mostly dead and moribund limpets, was observed as early as Feb. 1, with thousands of dead individuals being observed by Feb. 4. The earliest evidence of lethal exposure of sea birds was noted on Feb. 1 when dead, oiled Adélie penguins and blue-eyed shags were found in Biscoe Bay adjacent to Palmer Station. The mortality rate during the spill was less than 300 individuals over a 3-week period, with 89% being penguins and shags. One year after the spill several areas exhibited continued contamination due to chronic low-level leakage from the ship. Subtidal sediments and distant intertidal locations contained no detectable PAH. Exceptions were two beaches on Hermit and Cormorant Is. and limpets in close proximity to the wreck. Two years after the release of DFA into Arthur Harbor, little spill-related contamination could be detected in intertidal or subtidal limpets.

B-51399

McDonald, S., Kennicutt, M.C., II, Foster-Springer, K., Krahn, M., **Polynuclear aromatic hydrocarbon exposure in antarctic fish**, *Antarctic journal of the United States*, 1992, 27(5), p.333-335, 7 refs.

A study was undertaken to assess polynuclear aromatic hydrocarbon (PAH) exposure in fish. The bile of *Notothenia coriiceps neglecta* captured near Palmer Station and the *Bahia Paraiso* wreck and *Notothenia coriiceps neglecta*, *Notothenia gibberifrons*, and *Chaenocephalus aceratus* captured near remote sites (Low I. and Dallmann Bay) was screened by HPLC/fluorescence detection. Assessing PAH exposure in antarctic fish by screening bile using HPLC/fluorescence detection is useful, but must be confirmed by other techniques to minimize the false positive indications of exposure caused by spectral interferences noted in some bile samples.

B-51400

Kennicutt, M.C., II, McDonald, T.J., McDonald, S.J., **Hydrocarbon contamination in Arthur Harbor, Anvers Island**, *Antarctic journal of the United States*, 1992, 27(5), p.335-337, 14 refs.

World attention was focused on pollution along the Antarctic Peninsula in 1989 when the Argentine supply ship *Bahia Paraiso* ran aground in Arthur Harbor. This incident highlighted the consequences of catastrophic release of hydrocarbons. Point source releases, such as spills, are dramatic events. However, a more insidious problem is long-term, sub-lethal exposure of marine ecosystems to contaminants due to everyday activities. The authors report the initial findings of a study of hydrocarbons in the organisms and sediments adjacent to Palmer Station. The highest concentrations of tissue contaminants were found in intertidal areas adjacent to high levels of onshore soil contamination. Limpets preferentially incorporated more water soluble aromatic compounds, suggesting exposure to dissolved contaminants in runoff rather than particulate or slick-derived

materials. This was in contrast to subtidal sediments which were primarily contaminated with freshly spilled diesel fuel. While contamination is detectable in limpets in the vicinity of Palmer Station, the concentrations observed were one to two orders of magnitude lower than the contamination caused in intertidal limpets by the *Bahia Paraiso* diesel fuel spill.

B-51405

Hovenden, M.J., Jackson, A.E., Seppelt, R.D., **Field photosynthetic activity of lichens in the Windmill Islands oasis, Wilkes Land, continental Antarctica**, *Physiologia plantarum*, Mar. 1994, 90(3), p.567-576, 32 refs.

In order to ascertain whether the major species of continental antarctic macrolichens are photosynthetically active during summer conditions, the chlorophyll fluorescence of three lichen species was monitored in the vicinity of Casey Station, Wilkes Land using a PAM-2000 modulated fluorescence system. Lichens were studied when in equilibrium with the atmosphere as well as when moistened by snow showers. Photochemical quantum yield was estimated and related to thallus water content as well as microclimatic conditions. Lichens were photosynthetically active only when moistened by snowfall or by run-off from snow melt. The levels of photosynthetic activity in the field for all species were influenced by microenvironmental conditions, and patterns in response were site and species specific. The highest levels of photosynthetic activity were reduced by cold as well as warm, bright conditions. Highest thallus water contents occurred during the middle of the day after substantial snowfalls. The results indicate that the lichens are photosynthetically inactive for most of the summer period and are totally reliant on snow as a water supply. This is important when modelling carbon gain and growth rates of continental antarctic lichens. (Auth. mod.)

B-51413

Piatkowski, U., et al, **Nekton community of the Scotia Sea as sampled by the RMT 25 during austral summer**, *Marine ecology progress series*, Sep. 8, 1994, 112(1-2), p.13-28, Refs. p.27-28.

The nekton community was sampled by a Rectangular Midwater Trawl (RMT 25) over the upper 1000 m of the Scotia Sea during Jan. 1991. A total of 81 nekton and micronekton species were collected from 2 sites, one in the oceanic western Scotia Sea (Stn 1) and the other on the north-western slope of the South Georgia shelf (Stn 2). Species composition, abundance, biomass and day/night vertical distribution were investigated. Crustaceans were the most important group in terms of species numbers (28 species) followed by mesopelagic fish (24), molluscs (15) and coelenterates (11). Species diversity increased with depth and was higher at Stn 2 (76 species) than at Stn 1 (62 species). Biomass in the upper 1000 m was considerably higher at Stn 1 than at Stn 2, mostly due to dense concentrations of the tunicate *Salpa thompsoni*. The other main contributors to the high biomass at Stn 1 were coelenterates and mesopelagic fish. Euphausiids (*Euphausia triacantha* and *E. superba*) accounted for 1.5 g wet wt/m² at Stn 2 during night, with *E. triacantha* the more important of the two. Except for *Bathylagus antarcticus* all common mesopelagic fishes showed a marked diurnal vertical migration. Spatial variability was analyzed by multivariate data analyses (clustering techniques) and related to hydrography. (Auth. mod.)

B-51414

Rodhouse, P.G., et al, **Utility and limits of biomass spectra: the nekton community sampled with the RMT 25 in the Scotia Sea during austral summer**, *Marine ecology progress series*, Sep. 8, 1994, 112(1-2), p.29-39, Refs. p.38-39.

An RMT 25 opening/closing net was used to sample the nekton community at 2 stations in the ice free zone of the Scotia Sea. Oblique hauls sampled 200 m depth layers to 1000 m during both day and night. Total and individual volumes of each species in each 200 m layer were measured by displacement. The data were used to generate biomass and numerical spectra for day and night at each station for the whole water column to 1000 m. At both stations the relationship between log₁₀ biomass density (B/A) and log₁₀ individual body mass (M) were strongly positive. Slopes of the biomass spectra were not significantly different between the day and night stations and an overall regression showed that biomass density scaled as M^{0.61}. Analysis of biomass spectra revealed that although the species composition and biomass density varied between the 2 stations, energy turnover in the nekton community in the 2 areas was similarly dom-

inated by animals of larger size. Use of biomass spectra in this case study was shown to enhance insight into the comparative function of 2 pelagic systems obtained using a conventional taxonomic approach. (Auth. mod.)

B-51417

Wiencke, C., et al, **Temperature requirements and biogeography of antarctic, arctic and amphiequatorial seaweeds**, *Botanica marina*, May 1994, 37(3), p.247-259, Refs. p.258-259.

The temperature requirements for growth and survival of cold water seaweeds from both hemispheres are compared and discussed in relation to the climatic history of the various regions and in relation to the origin of amphiequatorial distribution patterns. Endemic antarctic species are most strongly adapted to low temperatures. In contrast, endemic arctic macroalgae show higher temperature demands and correspond in their temperature responses to many antarctic cold-temperate species. Arctic cold-temperate species show similar temperature requirements to cold-temperate species from southernmost South America. The first steps in the adaptation of macroalgae to low temperatures are an increase in cold tolerance and an increase of growth and reproduction rates at low temperatures. Later, the ability to grow and reproduce at above 15 to 20 C and to survive temperatures above 20 C is lost. The last steps in the adaptation to low temperatures include the loss of ability to grow and reproduce at above 5 or 10 C and a strong reduction in the upper survival temperatures (UST) down to 10-13 C. This temperature response type is typical for endemic antarctic species exposed to cold waters for at least 14 My. Findings strongly favor a migrationist jump across the equator to the other hemisphere during Pleistocene lowering of the water temperatures in the tropics. (Auth. mod.)

B-51418

Skura, K.E., Balushkin, A.V., **On the discovery of the ringed *Notolepis*, *Notolepis annulata* (Paralepididae), in the Bellinghausen Sea (Antarctica)**, *Journal of ichthyology*, 1993 (Pub. June 1994), 34(2), p.112-114, Translated from Voprosy ikhtiologii. 6 refs.

During the 1978-1979 Polish Antarctic expedition to the Bellinghausen Sea by the R/V *Professor Sidletski*, three unusual specimens of *Notolepis* were caught. They were provisionally identified as *Notolepis coatsi* (Skora, 1979; Skora and Sosinski, 1983). A reexamination of these specimens revealed that they belong to another species—the ringed *Notolepis*, *Notolepis annulata*, which was described in 1978 from the southwestern Atlantic. A description is given of these three specimens of *N. annulata*. (Auth. mod.)

B-51419

Evseenko, S.A., **Larval and juvenile fishes from collections made under the ice in the Weddell Sea**, *Journal of ichthyology*, 1993 (Pub. June 1994), 34(2), p.128-133, Translated from Voprosy ikhtiologii. 10 refs.

In the course of the Russian-American expeditions at floating stations in the Weddell Sea between Dec. 1991 and Apr. 1992, larval and juvenile fishes were collected in the region of the continental slope of the Antarctic Peninsula. The collections included one juvenile *Cryodraco atkinsoni* of a standard length (SL) of 98 mm, four *Neopagetopsis ionah* of SL 82, 83, 86, and 93 mm, and three larval *Pagothenia brachysoma* of SL 28.5, 30, and 31 mm. Used for comparison with the genus *Cryodraco* were one small *C. antarcticus* SL 154 mm, from the collection of the Zoological Museum of Moscow State University, and a series of 17 larvae (prejuveniles) of this species SL 39-70 mm, used by Efremenko (1983) for the description of the early stage of development of *C. antarcticus*. Also described are the developmental stages of two species (*C. atkinsoni* and *P. brachysoma*) which had previously not been known. (Auth. mod.)

B-51420

Hennion, F., Fiasson, J.L., Gluchoff-Fiasson, K., **Morphological and phytochemical relationships between *Ranunculus* species from Iles Kerguelen**, *Biochemical systematics and ecology*, July 1994, 22(5), p.533-542, 19 refs.

The three species of *Ranunculus* present on the Kerguelen Is. were investigated: *R. moseleyi*, *R. pseudotrullifolius* and *R. biternatus*. Representative individuals were collected in very diverse sites and analyzed for their morphometry and flavonoid pattern. The only flavonoid aglycone present is quercetin, accumulated mainly as 3-(phenolic acyl-osyl)gluco-

side-7-glucoside. The 3-terminal sugar is mainly glucose in *R. biternatus* vs xylose in the other two species; this pattern of taxonomic relationships mirrors that obtained from ecological and caryological characters. The variability reflects genetic differentiation in *R. biternatus*, a species of diverse but stable habitats, vs phenotypic plasticity in the other two species in response to fluctuating habitats. It is suggested that the endemic *R. moseleyi* is a very recent species evolved in this archipelago from *R. pseudotrullifolius*. (Auth.)

B-51421

Challet, E., et al, **Behavioural time budget of breeding King penguins (*Aptenodytes patagonica*)**, *Journal of zoology*, Aug. 1994, 233(4), p.669-681, Refs. p.680-681.

As do so many other seabirds, penguins fast when ashore for breeding. For penguins in dense colonies, territory defense seems to imply conflicting energetic requirements because of its assumed high energy cost, when the birds need to limit energy expenditure to cope with their fast. In this context, behavioral time budget over 24 h was investigated during breeding in the King penguin by using a remote-controlled videocamera. The comparison of day-night activity was performed in relation to breeding status (incubation vs. brooding) and duration of fasting (beginning vs. end of incubation shift). Five categories of behaviors were quantified: territory defense, comfort, resting, sleeping and chick-feeding. Breeding King penguins remain active by day as well as by night. Between incubation and brooding the authors found a threefold increase in the energy consuming territory defense, together with a drastic decrease in that posture which corresponds to deep sleep, i.e. when most energy is saved. These increases in aggressiveness and vigilance may be related to protection of the newly hatched chick. Between the onset and the end of an incubation shift, the time spent in sleep increases threefold, whereas territory defense remains unchanged. (Auth. mod.)

B-51422

Coleman, C.O., et al, **Taxonomy of two iphimeriid amphipods (Crustacea) from the southern ocean**, *Journal of natural history*, Sep.-Oct. 1994, 28(5), p.1059-1075, 7 refs.

The crustacean *Gnathiphimedia watlingi* n.sp. is described. This species is similar to *G. barnardi* but can be distinguished by the shortened pair of dorsal teeth of pleonite 3 and the unsegmented 1st flagellar article of antenna 1. A redescription of *Iphimeriella margueritei* is given and its mandible variability discussed. (Auth.)

B-51424

Vacchi, M., Greco, S., La Mesa, M., **Ichthyological survey by fixed gears in Terra Nova Bay (Antarctica). Fish list and first results**, *Memorie di biologia marina e di oceanografia*, Nov. 1992, Vol.19, International Workshop Aree Subantartiche, Lecce, Italy, Oct. 21-22, 1991. Proceedings, edited by G. Magazzù, p.197-202, 4 refs.

During the Italian 1990-91 Antarctic Expedition a second survey was carried out by the working group "Necton and Fishable Resources" in the waters off of Terra Nova Bay Station. This survey allowed the following operations: sampling down to -700 m; enlarging the previous faunistic list; marking specimens of the two most abundant fish species, i.e. *Pagothenia bernacchi* and *Chionodraco hamatus*; and catching, for the first time, three specimens of the giant fish *Dissostichus mawsoni*. Statistical analysis of the data allowed the authors to study the possible correlations between fish abundance and parameters such as depth-related factors, fishing gear, station and period.

B-51426

Barnes, D.K.A., Clarke, A., **Seasonal variation in the feeding activity of four species of antarctic bryozoan in relation to environmental factors**, *Journal of experimental marine biology and ecology*, Aug. 22, 1994, 181(1), p.117-133, Refs. p.131-133.

The feeding activity of 4 species of cheilostome bryozoans from differing depths, sites and substrata were monitored *in situ* at Signy I. Feeding activity was recorded photographically, monitoring the same colonies over 2 yr. The patterns of feeding activity differed among the 4 species in duration, timing and the degree of between-colony variation. All 4 species, however, spent most (and in the case of the massive foliose *Arachnopusia inchoata*, all) of the study period with a high proportion of their lopho-

phores everted. Two erect flustrid species *Alloeflustra tenuis* and *Nematoflustra flagellata* showed similar seasonal patterns but differed systematically in the timing of feeding. The shallow water *Inversiula nutrix* differed in its high between-colony variability and the low mean level of feeding activity. These patterns showed no clear relationship to environmental cues such as ice cover, temperature, chlorophyll concentration or vertical flux. It is clear, however, that these species are adapted to feed at very low cell concentrations; results indicate that the polar winter may be shorter and less harsh for shallow water benthic suspension feeders than previously thought. (Auth. mod.)

B-51427

Tamburrini, M., Condò, S.G., Di Prisco, G., Giardina, B., **Adaptation to extreme environments: structure-function relationships in Emperor penguin haemoglobin**, *Journal of molecular biology*, Apr. 15, 1994, 237(5), p.615-621, Refs. p.620-621.

The functional properties of the single haemoglobin (Hb) of the Emperor penguin have been investigated at different temperatures as a function of proton and organic phosphate concentration. The complete amino acid sequence has been established. Comparison with that of human HbA shows 12 substitutions in the contact regions of AB dimers. In addition to overall similarities shared with most of the avian Hbs previously described, this Hb shows significant differences, which could be related to the peculiar behavior of this penguin. In particular the authors note that the shape of the Bohr effect curve seems well adapted for gas exchange during very prolonged dives, preserving penguin Hb from a sudden and not controlled stripping of oxygen; and that the very minor enthalpy change observed at lower pH could be an example of molecular adaptation, through which oxygen delivery becomes essentially insensitive to exposure to the extremely low temperatures of the environment. The small alkaline Bohr effect has been found to be only chloride-linked, since the pH dependence of the oxygen affinity is totally abolished in the absence of this ion. These functional characteristics are discussed on the basis of the primary structure of A and B-chains. (Auth.)

B-51428

Melick, D.R., Hovenden, M.J., Seppelt, R.D., **Phytogeography of bryophyte and lichen vegetation in the Windmill Islands, Wilkes Land, continental Antarctica**, *Vegetatio*, 1994, 111(1), p.71-87, 33 refs.

The distribution and frequency of bryophyte and lichen vegetation on ice-free regions of the Windmill Is. are presented using data derived from aerial photography and ground surveying. The qualitative and quantitative plant cover of sites is listed and related to the topography and major soil characteristics of each site. The richest associations of macrolichens and bryophytes occurred on the metamorphic northern peninsulas. Species richness and frequency were generally reduced on the charnockitic southern peninsula and the islands which have been deglaciated longer. Salinity varied significantly throughout the region, with the highest levels in the northern islands reflecting the presence of penguin colonies. In such sites bryophytes and lichens were virtually absent. Wind blown sea-spray contributed far less salts than direct excretion from penguins. The total phosphorus and nitrogen levels of the skeletal soils were generally low except in eutrophic sites adjacent to penguin colonies. The vegetation patterns are discussed in terms of the climate, topography and species autecology. (Auth. mod.)

B-51431

Pakhomov, E.A., Perissinotto, R., McQuaid, C.D., **Comparative structure of the macro-zooplankton/micronekton communities of the Subtropical and Antarctic Polar Fronts**, *Marine ecology progress series*, Aug. 11, 1994, 111(1-2), p.155-169, Refs. p.167-169.

The composition, distribution, abundance, biomass and size-structure of macroplankton/micronekton communities at the Subtropical Convergence (STC) and the Antarctic Polar Front (APF) regions were investigated during the South African Antarctic Marine Ecosystem Study (Jan.-Feb. 1993 and June-July 1993). A total of 115 and 32 macroplankton/micronekton species composition indicated the occurrence of 3 different plankton communities: one in the STC region, another to the north of the APF and the third to the south of the APF. Although the APF and the STC were investigated in different seasons, average abundance and biom-

ass were similar in both regions. Tunicates, euphausiids, decapods and myctophiid fishes dominated the total stock of the 2 frontal regions, in terms of both abundance and biomass. The dominant size-classes were composed of a small group of 5 to 30 mm siphonophores, tunicates and euphausiids and a larger group of 40 to 80 mm euphausiids, chaetognaths, vertically-migrating decapods and myctophiid fishes. (Auth. mod.)

B-51432

McClintock, J.B., **Triphic biology of antarctic shallow-water echinoderms**, *Marine ecology progress series*, Aug. 11, 1994, 111(1-2), p.191-202, Refs. p.200-202.

Antarctic echinoderms appear to be adapted to a benthic environment characterized by long-term low availability of food resources. As predicted for a low-energy system, most echinoderms appear to expend little energy on feeding. Moreover, they are primarily generalists which opportunistically display scavenging or necrophagous feeding habits. Others exploit detrital material, or ingest microorganisms from the benthos and plankton. Those echinoderms which are feeding specialists exploit prey which are low in energy content yet extremely abundant, such as sponges. Even though individuals may have a low energy intake, it is likely that echinoderms play a significant role in energy transfer in antarctic benthos, as they are among the most abundant of epibenthic macroinvertebrate groups in shallow antarctic seas. (Auth.)

B-51439

Bartsch, I., **Synopsis of the antarctic Halacaroida (Acari)**, *Synopses of the antarctic benthos*, 1993, Vol.4, Theses zoologicae, Vol.21. Edited by R. Fricke, 176p., Refs. p.171-172.

DLC QL458.2.H3B39

The halacarids considered in this monograph are those known from Antarctica, South Georgia and South Sandwich Is. and the islands completing the Graham Ridge. A checklist of antarctic halacaroid genera and species—including the subfamilies Halacarinae, Copidognathinae, Lohmannellinae, and Rhombognathinae—and the key to the antarctic genera, as well as the keys to the species, are presented. They include diagnosis, biology, distribution and remarks. The descriptions are illustrated by analytical drawings and maps.

B-51440

Axelsson, M., Davison, B., Forster, M., Nilsson, S., **Blood pressure control in the antarctic fish *Pagothenia borchgrevinki***, *Journal of experimental biology*, May 1994, Vol.190, p.265-279, Refs. p.278-279.

DLC QH301.J68

The mechanisms of cardiovascular control in the antarctic fish *Pagothenia borchgrevinki* were investigated during rest and swimming exercise using pharmacological tools to reveal the nature of the control systems involved. Simultaneous and continuous recordings of ventral and dorsal aortic blood pressure, heart rate and ventral aortic blood flow (cardiac output) were made using standard cannulation procedures and a single-crystal Doppler flowmeter. Exercise produced a clear and consistent decrease in dorsal aortic blood pressure caused by a decrease in systematic vascular resistance. At the time, ventral aortic blood pressure increased owing to the combined effects of a markedly increased cardiac output (by about 80%) and branchial vasoconstriction. Judged from the effects of the alpha-adrenoceptor antagonist prazosin, control of the branchial vasculature involves an alpha-adrenoceptor-mediated vasoconstriction, in addition to more traditional cholinergic vasoconstrictor and B-adrenoceptor-mediated dilatatory mechanisms. The range of heart rates is large, from 3-4 beats/min in individual fish during hypertensive bradycardia to about 28 beats/min after atropine treatment. Both chronotropic and inotropic effects cause a marked increase in cardiac output during exercise. The increase in blood pressure caused by adrenaline injection was due largely to an increase in cardiac output, while direct effects on the systemic vasculature were small and transient. The increase in cardiac output, in turn, was due solely to an adrenergic stimulation of stroke volume. (Auth. mod.)

B-51442

Scully, R.T., **Convention on the Conservation of Antarctic Marine Living Resources**, Large marine ecosystems: stress, mitigation, and sustainability. Edited by K. Sherman, L.M. Alexander

and B.D. Gold, Washington, D.C., American Association for the Advancement of Science, 1993, p.242-251, 10 refs.

DLC Q181.A1A86 No.92-39S

The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) represents an international effort to apply an ecosystem-wide approach to the conservation of living resources. It is the first international agreement that defines its area of application and objectives by specific reference to a marine ecosystem. CCAMLR applies to the populations of all species of living organisms found south of the Antarctic Convergence or Polar Front. Its conservation objective includes maintenance of ecological relationships between harvested, dependent, and related populations; restoration of the health of depleted populations; and prevention of changes in the marine ecosystem that are not potentially reversible over 2 or 3 decades. This chapter examines the ongoing effort to implement CCAMLR with reference to the lessons it may offer for the methodology of managing large marine ecosystems.

B-51448

Øvstedal, D.O., Smith, R.I.L., **New *Pannaria* species from the Antarctic**, *Cryptogamie, bryologie, lichénologie*, 1993, 14(4), p.337-340, 7 refs.

Recent studies of several collections of antarctic lichens in the British Antarctic Survey Herbarium have revealed a number of specimens of an unknown species of *Pannaria*. In spite of an intensive search in major herbaria and thorough study of the relevant literature, no matching previously described species could be found. Consequently, it is described as a new species, *Pannaria austro-orcadensis* øvstedal, sp.nov. from the northern maritime Antarctic; it is characterized by its purple-brown lobulate thallus, brown apothecia, smooth spores and no secondary products. It grows on moist gravelly soil and bryophytes. (Auth. mod.)

B-51449

Boyd, I.L., **Selecting sampling frequency for measuring diving behavior**, *Marine mammal science*, Oct. 1993, 9(4), p.424-430, 16 refs.

This paper evaluates, using examples from the diving records of a southern elephant seal and an antarctic fur seal, the degree to which intervals between sampling affects the ability to identify dives, and the ultimate effect this has on the descriptive statistics of diving behavior. Southern elephant seals are deep (300-500 m), long (15-30 min), and continuous divers, whereas antarctic fur seals are shallow (15-30 m) and short (1-2 min) divers with dives occurring in bouts broken by variable periods at the surface. These species represent the extremes of diving patterns in pinnipeds. Wildlife Computers Mk III TDRs were used with a single data sampling protocol. Intervals between sampling of 5 and 10 sec were used for the fur seal and the elephant seal respectively, which are 2-9 times shorter than commonly used sampling intervals.

B-51450

Andriiashev, A.P., **General review of the antarctic bottom fish fauna**, Congress of European Ichthyologists, 5th, Stockholm, 1985. Proceedings. Edited by S.Ø. Kullander and B. Fernholm, Stockholm, Swedish Museum of Natural History, 1987, p.357-372, SPRI Pam (*80): 597, Refs. p.367-372.

The antarctic bottom fish fauna is reviewed with emphasis on new data obtained during the last 20 years. The recorded number of bottom fish species has increased twofold, to about 203 species (including 85 new), representing 86 genera and 28 families. The number of endemic taxa remains extremely high in the antarctic region, about 88% of the species and 76% of the genera. Specific adaptations to extreme conditions of life have become known; the defense function of the glycoprotein antifreezes in notothenioid blood was discovered. The necessity of decreasing the blood viscosity is the main cause of the erythrocyte reduction in all species of white-blooded fishes (Channichthyidae); compensatory adaptations assisting in overcoming a low oxygen capacity in the channichthyid blood are described. A particular lifeform, the cryopelagic species, evolved under the antarctic fast and drift ice. Pelagization is typical of many secondarily pelagic species as an adaptation for feeding on krill. The phenomenon of glacial submergence (i.e. the maximal species diversity shifted to greater depths) is confirmed by new data. (Auth. mod.)

B-51452

Culik, B., et al, **Energy requirements of Adélie penguin (*Pygoscelis adeliae*) chicks**, *Journal of comparative physiology B*, 1990, Vol.160, p.61-70, Refs. p.69-70.

The energy requirements of Adélie penguin chicks were analyzed with respect to body mass and various forms of activity (lying, standing, minor activity, locomotion, walking on a treadmill). Direct respirometry was used to measure O₂ consumption and CO₂ production. Heart rate (HR, bpm) was recorded from the ECG obtained by both externally attached electrodes and implantable HR-transmitters. The parameters measured were not affected by hand-rearing of the chicks or by implanting transmitters. HR measured in the laboratory and in the field were comparable. Metabolic rate in small wild chicks (0.14-0.38 kg) was not affected by time of day, nor was their feeding frequency in the colony. Regressions of HR on Vo₂ were highly significant (p<0.0001) in transmitter-implanted chicks, and two relationships are proposed for the pooled data, one for minor activities, and one for walking. Oxygen consumption, mass of the chick (2-3 kg), and duration of walking were related; mass-specific O₂ consumption was related to walking speed. (Auth. mod.)

B-51453

Guinet, C., **Hunting behavior of killer whales (*Orcinus orca*) around the Crozet Islands** [Comportement de chasse des orques (*Orcinus orca*) autour des îles Crozet], *Canadian journal of zoology*, Sep. 1992, 70(9), p.1656-1667, In French with English summary. Refs. p.1666-1667.

Killer whales around the Crozet Is. consume a great variety of prey, including fish, penguins, elephant seals, and occasionally large cetacea. Predation techniques used on elephant seals and penguins, which are easily observed from the shore, are described. Hydrophones were used to record the acoustic behavior of the whales during their hunts for both types of prey. The successful predation of 29 elephant seals was observed, 24 of which were weaned pups. Seals were captured along the banks, near river outlets, by voluntary stranding of the whales on the beaches, or by attack on seals swimming in bays. Hunting techniques were routinely used in "strategic" points apparently chosen specifically according to location and climatic factors. King penguins were hunted along the banks, particularly where algae prevailed, or offshore. While hunting, whales tended to be very quiet and used acoustic signals sparingly, emitting a few isolated clicks and short-distance contact calls. Reactions of whales exposed to artificial sounds tended to show that they localize their prey by passive listening. When an elephant seal was captured, long distance contact calls characterized by excitement were emitted 72% of the time and resulted in the arrival, by "porpoising," of the most distant members of the group, along with whales of other groups coming from several km away. The author hypothesizes that the adaptive value of this behavior is to allow the size of the hunting unit to adjust itself to the size of the prey by permitting not only members of the same group to associate, but also members of other groups to associate temporarily. (Auth.)

B-51455

Hunter, S., **Identification of Giant petrels *Macronectes* spp**, *Sea swallow*, 1983, Vol.32, p.72-76, 25 refs.

Giant petrels are large surface-nesting members of the family *Procellariidae*. Only one form, *Macronectes giganteus* (Gmelin) was recognized until Bourne & Warham (1966) showed that two sibling species existed. They distinguished them, using a number of criteria: plumage, bill color, distribution, timing of the breeding cycle and failure to interbreed when they occurred together. A number of workers have written about plumages and other identification criteria, but it has become obvious that different populations exhibit different characteristics, complicating their identification. The aim of this paper is to offer a guide to the identification of these two forms to encourage more observers to try to identify giant petrels at the species level, especially at sea, and thus obtain more data on their comparative status and distribution.

B-51465

Berteaux, D., Micol, T., **Population studies and reproduction of the feral cattle (*Bos taurus*) of Amsterdam Island, Indian Ocean**, *Journal of zoology*, 1992, 228(2), p.265-276, 33 refs.

Amsterdam I. has supported a population of feral cattle since 1871. In 1987 a fence was erected across the island, and in 1988 and 1989 the whole population (n=1059) living south of the fence (study area) was removed. Nine hundred and sixty-one culls were analyzed. Age of calves indicated that reproduction was seasonal, as 78% of births occurred within 4 months. Age at first calving ranged from 2-4 years. An estimation of the fertility (rate of conception) was 0.73 fetuses per cow per year. In the northern part of the study area, 50-80 males have been killed for beef each year since 1951. The effect of hunting was analyzed and a zone where cattle had been free from human interference was defined. In this zone sex ratio was biased towards males (252 M:201 F), owing to female biased mortality in individuals older than three years. The cause of the biased mortality might be a differential use of food resources between sexes. (Auth.)

B-51467

DeLong, E.F., Wu, K.Y., Prézelin, B.B., Jovine, R.V.M., **High abundance of Archaea in antarctic marine picoplankton**, *Nature*, Oct. 20, 1994, 371(6499), p.695-697, 24 refs.

Archaea (archaeobacteria) constitute one of the three major evolutionary lineages of life on Earth. Recently, novel (uncultivated) phylotypes of Archaea have been detected in coastal and subsurface marine waters, but their abundance, distribution, physiology and ecology remain largely undescribed. Reported here is the exceptionally high archaeal abundance in frigid marine surface waters of Antarctica. Pelagic Archaea constituted up to 34% of the prokaryotic biomass in coastal antarctic surface waters, and they were also abundant in a variety of other cold, pelagic marine environments. Because they can make up a significant fraction of picoplankton biomass in the vast habitats encompassed by cold and deep marine waters, these pelagic Archaea represent an unexpectedly abundant component of the Earth's biota. (Auth. mod.)

B-51469

Fritsen, C.H., Lytle, V.I., Ackley, S.F., Sullivan, C.W., **Autumn bloom of antarctic pack ice algae**, *Science*, Nov. 4, 1994, 266(5186), p.782-784, 26 refs.

An autumn bloom of sea-ice algae was observed from Feb. to June of 1992 within the upper 0.4 m of multiyear ice in the western Weddell Sea. The bloom was reliant on the freezing of porous areas within the ice that initiated a vertical exchange of nutrient-depleted brine with nutrient-rich seawater. This replenishment of nutrients to the algal community allowed the net production of 1760 mg of carbon and 200 mg of nitrogen per sq m of ice. The location of this autumn bloom is unlike that of spring blooms previously observed in both polar regions. (Auth.)

B-51470

Hasle, G.R., Medlin, L.K., Syvertsen, E.E., **Synedropsis gen.nov., a genus of araphid diatoms associated with sea ice**, *Phycologia*, July 1994, 33(4), p.248-270, 40 refs.

A new araphid diatom genus, *Synedropsis* Hasle, Medlin et Syvertsen, is described from sea ice. The generitype, *Synedropsis hyperborea* (Grunow) Hasle, Medlin et Syvertsen from the Arctic was first described as a species of *Synedra*, as was the antarctic *Synedropsis fragilis* (Manguin) Hasle, Syvertsen et Medlin. A second antarctic species of *Synedropsis* is a new combination of *Cymatosira laevis* Heiden in Heiden & Kolbe. In addition four new taxa, *S. hyperboreoides* Hasle, Syvertsen et Medlin, *S. recta* Hasle, Medlin et Syvertsen, *S. lata* Hasle, Medlin et Syvertsen and *S. lata* var. *angustata* Hasle, Medlin et Syvertsen are described from the Antarctic. The valve wall is laminar with uniseriate, often poorly developed striae and a wide sternum. Each valve possesses apical fields composed of slits. A labiate process is positioned near one apical slit field. The valve outline for most species exhibits considerable stadal variation. The girdle has several bands, most with one row of poroids close to the pars interior. Thus *Synedropsis* is closely related to the marine *Fragilaria striatula* Lyngbye except in the structure of the apical fields and the number of bands. (Auth. mod.)

B-51471

Young, E., **Skua and penguin: predator and prey**, Cambridge, University Press, 1994, 452p., Refs. p.433-443.

DLC QL696.C488 Y68 1994

Areas of barren rock and scree around the edge of Antarctica provide a breeding ground for two of the continent's most well-known species of bird: the south polar skua and the Adélie penguin. This book considers the relationship between these two species, taking as its study site Ross I. Through detailed observations of the foraging ecology of the skua, the traditional view that skuas are totally dependent on penguin eggs and chicks for food is challenged. In addition, studies of the impact of skuas on penguin breeding and the extent to which the skua breeding cycle is functionally related to that of the penguin provide further evidence to suggest that the two species occur together independently as a consequence of limited breeding space, rather than as a result of a distinct predator-prey relationship. (Auth.)

B-51500

Castello, M., Nimis, P.L., **Critical notes on the genus *Candelariella* (Lichenes) in Antarctica**, *Acta botanica fennica*, 1994, No.150, p.5-10, 26 refs.

A revision of several species described by C.W. Dodge from Antarctica reveals that this author treated *Candelariella* under several generic names (*Blastenia*, *Biatorrella*, *Eklundia*, *Protoblastenia*), while the two *Candelariella* species reported from Antarctica, *C. albobirens* C.W. Dodge & G.E. Baker and *C. rudolphi* C.W. Dodge, are synonyms of *Lecanora fuscobrunnea* C.W. Dodge and G.E. Baker and *Xanthoria elegans* (Link) Th.Fr., respectively. Three species of *Candelariella* occur in Antarctica: *C. aurella* (Hoffm.) Zahlbr., *C. flava* (C.W. Dodge & G.E. Baker) Castello & Nimis comb. nova, and *C. vitellina* (Hoffm.) Müll.Arg. (Auth. mod.)

B-51506

Navarro, E., **Natural and artificial radioactivity levels in water, soil and lichens** [Niveles de radioactividad natural y artificial presentes en el ecosistema antártico. Primeros estudios en aguas, tierras y líquenes], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.49-55, In Spanish with English summary. 19 refs.

The radioactivity levels detected in water and soil samples collected in the vicinity of Juan Carlos I Station are presented. They are found to be systematically lower than reference levels measured in Spain, including natural radionuclides. A partial justification for the relatively low dose rate measured with a proportional counter in the above mentioned zone, with a mean value of 0.14 micron Sv/h (or 1.23 mSv/yr), is given. (Auth. mod.)

B-51511

Cueto, M., et al, **Secondary metabolites from antarctic marine organisms** [Metabolitos secundarios de organismos marinos antárticos], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.95-101, In Spanish with English summary. 14 refs.

The structure and stereochemistry of two novel monoterpenes 7 and 8 isolated from the alga *Plocamium cartilagineum* and of the aceto-xyfimbrolides 10 and 11 obtained from the alga *Delisea fimbriata* are described. The study of the sponges *Cinachyra barbata* Sollas and *Xestospongia* sp. led to the identification of 12 steroids with delta⁵ and delta⁰ nuclei, the major component of *C. barbata* being 24-Methylcholesta-5, 22-dien-3B-ol and that of *Xestospongia* sp. 24-Methylcholesta-5, 24(28)-dien-3B-ol. (Auth.)

B-51512

Llarch, A., Tudela, E., García, J., Guinea, J., **Isolation and identification of thermophilous bacteria from Deception I.** [Aislamiento e identificación de bacterias termófilas procedentes de Isla Decepción (Shetland del Sur)], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th,

Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.103-109, In Spanish with English summary.

The identification and classification of 6 bacterial isolates from samples taken on Deception I. during Nov. 1989-Feb. 1990 are reported. Bacterial strain 1 was isolated from the sand of an inside lagoon, strains III and IV from water of a fumarole at the same site, strains T1 and T2 from water of another inside lagoon and strain VI from sediments of an underwater fumarole. Each sample was cultivated in two media. First results showed that all the isolates were Gram negative-stained, aerobic and sporulated bacilli, able to grow at temperatures above 60 C. Further chemotaxical studies confirmed that they belong to the genus *Bacillus*. Strains I and VI were close species due to their high similarity coefficient, showing little resemblance to the reference strains included. Strain T2, although it shows a low coefficient, is close to *B. licheniformis*. Strains IV and T1 seemed to be close species and strain III showed a notable similarity coefficient with *B. Kaustophilus*, assigned to the same group as *B. Stearothermophilus*. (Auth. mod.)

B-51513

López de la Cuadra, C.M., García Gómez, J.C., **Cheilostome Bryozoa collected by the Spanish Antártida 8611 expedition** [Briozoos queilostomidos procedentes de la campaña "Antártida 8611" del Instituto Español de Oceanografía: primeros resultados], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.111-115, In Spanish with English summary. 9 refs.

Thirty-three species of cheilostome Bryozoa collected by the Antártida 8611 expedition in waters surrounding South Georgia, South Orkneys Is., Elephant I. and South Shetland Is. are discussed. Preliminary results show that 3 of the referred species are first reports for South Georgia and 8 for the South Orkneys. Two species, *Smittina oblongata* and *Isoschizoporella secunda*, greatly increase their known distribution areas. A remarkably high abundance of flustriiform colonies was observed in samples from South Shetland Is. and Elephant I., while a greater variability of colony forms was observed in samples from South Georgia and the South Orkneys. (Auth. mod.)

B-51514

Peña Cantero, A.L., García Carrascosa, A.M., **Hydrozoans of the Antártida 8611 expedition** [Hidrozoos de la campaña "Antártida 8611"], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.117-140, In Spanish with English summary. Refs. p.128-130.

Hydroids from the Scotia Ridge area, collected during the 1986-87 Antártida 8611 Spanish expedition, have been identified as belonging to 25 species included in the families Haleciidae, Lafoeidae, Campanulariidae, Sertulariidae and Plumulariidae. A new species, *Selaginopsis vanhoeffeni*, is reported. Several coppinae of *Abietinella opertulata* have been discovered in a number of fertile colonies, allowing the authors to corroborate the assignment of this species to the family Lafoeidae, as suggested by other authors. A brief comment on each species and an analysis of its ecology and biogeography are included. (Auth.)

B-51515

Ramos Martos, A., Sobrino Yraola, I., **Analysis of macrobenthos catches during the Antártida 9101 expedition** [Análisis preliminar del macrobentos capturado en la campaña "Antártida 9101"], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.141-153, In Spanish with English summary. 18 refs.

During the Antartida 9101 cruise, carried out in Jan. and Feb. 1991, fishery resources of the South Orkney Is. continental shelf were prospected. More than 10 t of invertebrate (20% of total catch) belonging to 20 faunistic groups were caught in 124 hauls (95.4% of total hauls). Asteroidea and Holoturoidea (Echinodermata) showed the widest distribution. They were followed by Porifera, Ascidiacea and Actiniaria. Porifera were weight dominant (80.3%) followed by Echinodermata (12.7%) and Cnidaria (1.6%), while the numeric dominance was that of the Holoturoidea class species (55.3%). In general, the epibenthonic fauna displayed a patchy distribution. Highest density areas, above 5 mg/m², were found northwest and south of Laurie and Signy islands. The lowest densities were found in the southern continental shelf characterized by the presence of mud sediments. (Auth. mod.)

B-51516

Conde, F., Gallardo, T., **Macrophytobenthos of the Antártida 8611 expedition** [Macrofitobentos de la expedición "Antártida 8611"], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.155-157, In Spanish with English summary. 11 refs.

A catalog of 18 taxa of benthic marine algae, collected in the Scotia Sea during the Spanish expedition to the Antarctic in the austral summer season (Nov. 1986-Feb. 1987), is given. Information about each species includes records of distribution within this region. The sublittoral flora exhibits a predominance of the genera *Desmarestia* and *Myriogramme*. (Auth.)

B-51517

Gallardo, T., Alvarez Cobelas, M., **Marine benthic flora in Miles Bay** [Flora bentónica marina de la Bahía Sur, Isla Livingston (Shetland del Sur), Antártida], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.159-168, In Spanish with English summary. 32 refs.

As part of the Spanish Antarctic Expedition (1990-1991), a study of the flora of the sublittoral and littoral vegetation was carried out from Dec. 1990 to Jan. 1991 in Miles Bay. Thirty-eight benthic marine macro-algae taxa were identified and are described. (Auth.)

B-51518

Gallardo, T., Alvarez Cobelas, M., **Littoral benthic vegetation in Miles Bay** [La vegetación bentónica litoral de Bahía Sur, Isla Livingston, Shetland del Sur (Antártida)], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.169-173, In Spanish with English summary. 18 refs.

Some features of the vegetation and the vertical zonation of the littoral benthic algae in Miles Bay are described. The variability and disposition of the algae relative to wave activity are emphasized. (Auth.)

B-51519

Sobrino, I., Balguerías, E., **Distribution and biology of the fishes *Chaenocephalus aceratus* and *Chionodraco rastrospinosus*** [Algunos datos sobre la distribución y biología de *Chaenocephalus aceratus* Lönnberg, 1906 y de *Chionodraco rastrospinosus* De Witt & Hureau, 1979 (Peces, Channichthyidae), obtenidos durante la campaña "Antártida 9101" en el archipiélago de Orcadas del Sur], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión

Interministerial de Ciencia y Tecnología, 1991, p.175-195, In Spanish with English summary. 15 refs.

Studies of length and biological samplings on *Chaenocephalus aceratus* Lönnberg, 1906 and *Chionodraco rastrospinosus* Dewitt & Hureau, 1979 were carried out during the Spanish cruise Antartida 9101 to the South Orkneys on Jan. 19-Dec. 10, 1991. Maximum yields of *C. aceratus* were obtained between 150 and 250 m depth; *Crastrospinosus* was more abundant at depths in the range of 250 to 500 m. Length-weight relationships calculated by sex and by maturity stage did not show significant differences in either species. The global sex-ratio was around 50% in both species, exhibiting some variations in relation to length and depth. Most mature individuals (stage III) were found in shallower waters. Estimated lengths at first maturity for males and females of *C. aceratus* and *C. rastrospinosus* were respectively: 40.6, 44.3, 23.4 and 23.9 cm. Corresponding lengths at first spawning were: 47.8, 56.9, 24.7 and 27.3 cm. (Auth. mod.)

B-51520

Olaso, I., Pereiro, J., **Trophic relationships of demersal fishes from the South Orkney Is.** [Relaciones tróficas de los peces demersales de las Islas Orcadas del Sur], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.197-207, In Spanish with English summary. 20 refs.

In Jan.-Feb. 1991 a survey of demersal fishing biology was carried out on the continental shelf of the South Orkney Is. To further the knowledge of the trophic structure of the demersal system, the stomach contents of 24 species of fish were analyzed. The energy flux is determined by a few pieces, from which the ten most representative in terms of number and biomass are selected. These species correspond to the Channichthyidae, Nototheniidae and Myctophidae families. *Champsocephalus gunnari* and *Chionodraco rastrospinosus* feed on krill, while *Pseudo-chaenichthys georgianus* and *Chaenocephalus aceratus* are ichthyophagous. In the species of the second family feeding habits are varied, including benthophagous fish with *Notothenia gibberifrons* as a predator of polychaeta, echinoderms, and *Notothenia kempfi* feeding mainly on tunicata, being more specialized in epibenthos prey. Apart from species which grow to a large size and have a strong ichthyophagous component in their food, *Notothenia neglecta* and *Notothenia rossii* are opportunist species feeding on benthic fauna and krill. Comparison of the feeding diets of these ten most characteristic species in the food chain shows the different trophic overlaps which exist, through cluster analysis. (Auth. mod.)

B-51521

Molina Acevedo, A.D., Santana Fernández, J.C., **Some population parameters of *Notothenia gibberifrons* from the South Orkney Is.** [Contribución al conocimiento de algunos parámetros demográficos y biológicos de la población de *Notothenia gibberifrons* Lönnberg, 1905, en las Orcadas del Sur], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.209-218, In Spanish with English summary. 3 refs.

This paper presents some demographic and biological parameters of the population of *Notothenia gibberifrons* Lönnberg, 1905 from the South Orkneys. Length-frequency distributions, sex-ratio, length-weight relationships and lengths at first maturity are described. This information was obtained during the Antártida 9101 cruise, conducted in Jan.-Feb. 1991. The working area covered the South Orkneys shelf down to 500 m depth; 130 fishing hauls were carried out using a commercial bottom trawl with a mesh size in the cod-end of 35 mm. *N. gibberifrons* was the most abundant species in the catch. Specimens ranged from 104 to 462 mm in length. (Auth.)

B-51522

García Raso, J.E., López de la Rosa, I., **Caridea (Crustacea, Decapoda) collected during the Antártida 8611 expedition**

[Notas sobre los Carideos (Crustacea, Decapoda) recogidos por el I.E.O. durante campaña "Antártida 8611"], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.219-226, In Spanish with English summary. Refs. p.225-226.

During the Antártida 8611 Spanish expedition in 1986, four species of *Natantia* (Crustacea, Decapoda) were found. Of these, two form part of the exclusive and characteristic antarctic species, *Notocrangon antarcticus* and *Chorismus antarcticus*. The other two, *Acantheephyra pelagica* and *Pasiphaea rathbunae*, are pelagic species with a wider distribution. The latter is a new record for the Antarctic. (Auth.)

B-51523

Curt Martínez, J., **Observation of new species of cetaceans, pinnipeds and seabirds from the ship *Las Palmas*** [Nuevas especies faunísticas a añadir en el catálogo de cetáceos, pinnípedos y aves iniciado desde el B.O. *Las Palmas* durante sus navegaciones en la zona del Tratado Antártico en el verano austral 1988-1989], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.227-232, In Spanish with English summary. 7 refs.

The taxonomy and the number of whales, seals and seabirds observed from the ship *Las Palmas* in Jan.-Mar. 1989 and Nov. 1989-Jan. 1990, in the vicinity of South Shetland Is. and the Antarctic Peninsula, are listed.

B-51524

Curt Martínez, J., Samalea Perez, F., **Qualitative and quantitative study of the fauna from Hannah Point, Livingston Island** [Estudio cualitativo y cuantitativo de las especies faunísticas observadas en la península Hannah de la Isla de Livingston y valoración de este lugar como un ecosistema de singular interés científico], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.239-243, In Spanish with English summary. 4 refs.

Taxonomy and numbers of seals and seabirds found on Hannah Point between Dec. 10, 1989, and Jan. 31, 1991 are discussed and presented in a list. Fifteen faunistic species are identified, with the conclusion that the area's ecosystem is of singular scientific interest.

B-51525

Sancho, L.G., Sojo, F., **Additions to the floral catalog of lichens from Livingston I.** [Adiciones al catálogo florístico líquénico de Isla Livingston], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.245-249, In Spanish with English summary. 14 refs.

The authors present an addition of 43 new taxons to the floristic catalog from Livingston I. For some taxons, like *Coelocaulon epiphorellum*, *Lecanora handelii*, *Rinodina olicaceobrunnea*, *Sporastatia testudinea*, *Umbilicaria africana* and *Umbilicaria krascheninnikovii*, some taxonomic and biogeographic aspects considered of interest are discussed. (Auth.)

B-51526

Ott, S., Sancho, L.G., **Structure and adaptation of lichens to extreme environmental conditions in the maritime Antarctic (Livingston Island, South Shetland Islands)**, Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-

25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.251-256, With Spanish summary. 11 refs.

The anatomical and morphological structures of two lichens, *Placopsis contortuplicata* and *Blastenia caralligera*, were investigated in connection with mechanisms of colonization and adaptation to the special conditions of the maritime Antarctic. Although both species are crutose lichens, there are clear differences in relation to adaptational strategies. (Auth.)

B-51527

Sancho, L.G., Valladares, F., **Lichen colonization stages of recent moraines on Livingston I.** [Primeras fases de colonización líquénica de morrenas recientes en Isla Livingston (Shetland del Sur, Antártida)], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.257-267, In Spanish with English summary. Refs. p.266-267. For the English version of this article see 21B-48629.

The moraine studied on Livingston I., roughly 34 years old, was in an early stage of the plant succession. Plant communities were observed only on the boulders at the top of the moraine. They were always composed of a relatively small number of lichen species and with a low coverage of the rock surface. It is noteworthy that all lichen species observed lack asexual propagula and are considered to be nitrophylous or ornithocoprophilous. In some cases, a close relation between the boulder size and the measured variables (specimen diameter, coverage and number of species) was noted, with maximum values for the biggest boulders. The hypothetical biological implications of boulder size and the causes of the interspecific differences observed in the average diameter of lichens are discussed. (Auth.)

B-51528

Moreno, J., Bustamante, J., Cuervo, J.J., **Energy expenditure measurements in penguins by the doubly-labelled water technique** [La medición del gasto energético en pingüinos por medio del método del agua doblemente marcada con isótopos], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.269-279, In Spanish with English summary. 22 refs.

The doubly-labelled water technique (DLW) was developed by physiologists during the 1940s and has become an important tool in ecology as the only method available for measuring energy expenditure in free-living animals. During the 1990-91 Spanish Antarctic Expedition, the authors used DLW to measure the metabolic rates of Chinstrap penguins during the crèche stage on Deception I. Mean metabolic rate was 4326 kJ/day (3.7 times standard metabolism) and mean water flux 450 ml/day and kg (mean weight=3771 g). These rates are 1.3 and 2.4 times those predicted from an allometric equation based on DLW studies of other penguin species. The measured water flux is equivalent to a consumption of 1.6-2 kg of krill daily during the crèche stage, which for the census population of 165,000 reproducing adults on Deception I. indicates a daily consumption of 330 tons of krill. (Auth. mod.)

B-51529

Bustamante, J., Cuervo, J.J., Moreno, J., **Feeding behavior of Chinstrap penguins** [La función de las persecuciones alimenticias en el pingüino de barbijo, *Pygoscelis antarctica*], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.281-286, In Spanish with English summary. 8 refs.

The chicks of Chinstrap penguins must chase their parents before being fed. This characteristic behavior of Pygoscelid penguins has been given several interpretations in the literature. In an observational study of several colonies in a rookery on Deception I., the authors compared the frequency and duration of feeding chases in families with one and two chicks. Significantly more feeding occurred outside the crèche in two-chick than in one-chick families. Chases were significantly more frequent and prolonged in families with two than in those with single chicks. This difference was independent of the number of chicks present in the interactions (one or two siblings in two-chick families). Chases during feedings by single chicks were significantly less frequent and prolonged than by one chick in cases of absence of its sibling. Siblings chasing more intensively obtained more feedings. Chases allow parents to regulate food distribution between siblings according to their needs or hunger, but could allow brood reduction in times of food crises. (Auth.)

B-51530

Ferrer, M., Aguilar, J., Viñuela, J., **Physio-ecological studies of Chinstrap penguins on Deception I.** [Estudios fisioecológicos del pingüino de barbijo *Pygoscelis antarctica* en Isla Decepción], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.287-290, In Spanish with English summary. 7 refs.

During the 1990-91 antarctic expedition a series of physio-ecological studies on Chinstrap penguins were carried out at Deception I. It was confirmed that during fasting a protein utilization far quicker than the one described for other penguin species took place. Endogenous circadian rhythms were determined in several biochemical parameters, not related to the light-twilight alternation experienced by the birds. The results of blood analyses revealed that those breeders that hatch very unevenly sized offspring are in better nourishing conditions than the parents with offspring of equal size. Therefore, though offspring unevenness means a less successful breeding, it is advantageous from the point of view of parental survival. (Auth.)

B-51542

Schizas, N.V., Shirley, T.C., **Two new species of *Laophontodes* (Copepoda, Harpacticoida, Ancorabolidae) from McMurdo Sound, Antarctica, *Zoologica scripta*, July 1994, 23(3), p.205-216, 30 refs.**

Two new species of harpacticoid copepods of the family Ancorabolidae are described from a subtidal site in Cape Armitage, McMurdo Sound. *Laophontodes macclintocki* sp.n. and *L. spongiosus* sp.n. are easily distinguished from the remaining members of the genus *Laophontodes* by the setal formula of swimming legs P2-P4. (Auth.)

B-51543

Erséus, C., **Marine Tubificidae (Oligochaeta) of Antarctica, with descriptions of three new species of Phallodrilinae, *Zoologica scripta*, July 1994, 23(3), p.217-224, 17 refs.**

Five species of Tubificidae are recorded from antarctic waters: *Torodrilus lowryi* Cook, 1970, *Torodrilus* sp. (subfamily Rhyacodrilinae), *Marionidrilus antarcticus* sp.n., *M. weddellensis* sp.n., and *Thalassodrilus bicki* sp.n. (subfamily Phallodrilinae); only *T. lowryi* was known from Antarctica before. The status of the two Southern Hemisphere genera *Torodrilus* Cook, 1970, and *Marionidrilus* Erséus, 1992, are discussed. The taxonomic position of the two new species of *Marionidrilus* is somewhat uncertain. *T. bicki*, however, appears closely related to Northern Hemisphere taxa. (Auth.)

B-51544

Heyns, J., ***Chiloplacoides antarcticus* n.gen., n.sp. from western Dronning Maud Land, Antarctica (Nematoda: Cephalobidae), *Fundamental and applied nematology*, July 1994, 17(4), p.333-338, 9 refs.**

Chiloplacoides antarcticus n.gen., n.sp. is described from western Queen Maud Land. The new genus, which belongs in the Cephalobidae, is distinguished by prominent, distinctly separate globular lips; elongate,

plate-like labial probolae which are distally forked and without tines or fringes; absence of cephalic probolae; presence of long seta-like guard processes; and bilateral symmetry of the stoma just posterior to the oral opening. (Auth.)

B-51545

Meurk, C.D., **Regeneration of subantarctic plants on Campbell Island following exclusion of sheep**, *New Zealand journal of ecology*, 1982, Vol.5, p.51-58, 21 refs.

DLC QH540.N43

Permanent transects, established in 1970 to monitor the effects of sheep grazing on subantarctic palatable and dominant plants, are assessed. Sheep have a detrimental effect on most species considered, but regeneration is vigorous on the sheep-free side of a fence-line dividing Campbell I. (Auth.)

B-51546

Klaassen, M., **Growth and energetics of tern chicks from temperate and polar environments**, *Auk*, July 1994, 111(3), p.525-544, Refs. p.540-542.

The author compared the energetics of Arctic Tern (*Sterna paradisaea*) chicks from Spitsbergen and The Netherlands, Common Tern (*S. hirundo*) chicks and Sandwich Tern (*S. sandvicensis*) chicks from The Netherlands, and Antarctic Tern (*S. vittata*) chicks from King George I. Daily energy expenditure (DEE), measured using doubly-labeled water, was only slightly higher in the chicks from the polar environments, despite the higher levels of basal metabolism (BMR) and higher costs for thermoregulation. Apparently, thermoregulatory cost as part of the DEE of the chick is only a minor item owing to parental brooding, which may account for energy savings ranging from 40 to 80%. A simple model indicates that the magnitude of these savings is dictated by the parental time budget (i.e. the minimal foraging time needed to meet age-dependent energy requirements of the chick). Basal metabolic rate in chicks of the six available studies increased with latitude. The differences could relate to a higher capacity to produce heat, which is necessary in polar environments. The basal metabolic rates in adult terns, however, do not match this latitudinal pattern for the growing chicks. (Auth. mod.)

B-51557

Kirst, G.O., et al, **Ecophysiology of ice algae (Antarctica): dimethylsulfoniopropionate content and release of dimethylsulfide during ice melt**, International Symposium, Belgirate, Italy, Oct. 13-15, 1992. Proceedings. Dimethylsulphide: oceans, atmosphere and climate, edited by G. Restelli and G. Angeletti and Air Pollution Research Report 43, Dordrecht, Kluwer Academic Publishers, 1993, p.23-36, 17 refs.

DLC QC879.6.D56

During a cruise in the area of the northern Antarctic Peninsula (Dec. 1991; RV *Polarstern* ANT X1b) several phytoplankton blooms of varying species composition were encountered. The DMSP concentration correlated with the chlorophyll values; however, it changed indicating variation due to species specific production rates of DMSP. After crossing the Antarctic Convergence the authors found that the species composition of the phytoplankton resembled that of recently released ice algal assemblages. High chlorophyll and DMSP concentrations were observed in the Antarctic Sound and in the adjacent part of the Weddell Sea due to a mass development of *Phaeocystis*. The correlation between chlorophyll, DMSP, DMS and concentration of condensation nuclei (CN) was clearly evident. Maximum values measured were: DMSP 75 nM, DMS (water) 250 nM, DMS (air) >2000 ng/m³, while CN concentration ranged between 1000 and 1800 /mL. This indicates that during the ice melt Antarctica is an area of especially high DMSP and DMS production. (Auth.)

B-51565

Scharek, R., et al, **Transition from winter to early spring in the eastern Weddell Sea, Antarctica: plankton biomass and composition in relation to hydrography and nutrients**, *Deep-sea research I*, Aug. 1994, 41(8), p.1231-1250, 55 refs.

Hydrography and nutrient distribution in relation to plankton biomass and composition were studied during two transects (Oct. and Dec.) that crossed the ice-covered eastern Weddell Sea (approximately along the

Greenwich Meridian) from the ice edge at 58S to the continental margin at 70 deg 30'S in 1986. Despite the very low levels of plankton biomass encountered under sea ice in late winter, distinct differences, particularly in diatom abundance and species composition, were present between the northern, eastward-flowing and southern, westward-flowing limbs of the Weddell Gyre. On the basis of species composition and physiological state of diatom assemblages, the higher biomass of the northern limb is attributed to entrainment of plankton-rich water from the ice-free Circumpolar Current rather than to *in situ* growth. The pelagic community characteristic of the region under the pack ice throughout the study was dominated by nanoflagellates, ciliates and heterotrophic dinoflagellates. Break-up and melt of the ice cover in early Dec. occurred simultaneously over an extensive area yet did not elicit biomass build-up, even at the northern ice edge where favorable growth conditions appeared to prevail. (Auth. mod.)

B-51572

Ino, Y., **Field measurement of the photosynthesis of mosses with a portable CO₂ porometer at Langhovde, East Antarctica**, *Antarctic record*, July 1994, 38(2), p.178-184, With Japanese summary. 14 refs.

The photosynthesis of mosses was measured with a portable CO₂ porometer (modified Koito KIP9000) at Langhovde, East Antarctica in Jan. 1988. An assimilation chamber, 10 cm x 10 cm x 6.5 cm, which was made for this measurement, was used in collecting data for 9 h in Sample 1 and 11 h in Sample 2. Samples were mixed communities of *Bryum pseudotriquetrum* and *Ceratodon purpureus* (Sample 1) and *C. purpureus* (Sample 2) collected in the Yukidori Valley, Langhovde. Both samples had high respiration rates. Net photosynthetic rates were negative at low irradiance and changed to positive rates at high irradiance. Maximum photosynthetic rates were higher than those of other mosses measured with other equipment (analyzer: Horiba VIA-300, assimilation chamber: Koito MC-A3W) in the Yukidori Valley in the same period. (Auth.)

B-51587

Webby, R.F., Markham, K.R., **Isowertiajaponin 2"-O-Barabinopyranoside and other flavone-C- glycosides from the antarctic grass *Deschampsia antarctica***, *Phytochemistry*, July 1994, 36(5), p.1323-1326, 9 refs.

The major flavonoid constituents of the antarctic grass *Deschampsia antarctica* are shown to be the C-glycosylflavones, isowertiajaponin (7-O-methylorientin) 2"-O-B-arabinopyranoside and orientin. These are accompanied by lower levels of orientin 2"-O-arabinopyranoside, isowertisin (7-O-methylvitexin) 2"-O-B-arabinopyranoside, acylated derivatives, isowertisin, isowertiajaponin and triclin. A preliminary study suggests that the overall level of flavonoids in *Deschampsia* increases during the antarctic mid-summer. (Auth.)

B-51588

Moore, P.G., **Observations on the behaviour of the scavenging lysianassoid *Orchomene zschaui* (Crustacea: Amphipoda) from South Georgia (South Atlantic)**, *Marine ecology progress series*, Oct. 13, 1994, 113(1-2), p.29-38, 35 refs.

Orchomene zschaui (Pfeffer, 1888) dominated the catch of scavengers attracted to heads of dead elephant seals suspended above the sea bed at Husvik, South Georgia. No ovigerous females and few juvenile amphipods were captured. Activity was nocturnal. No lunar rhythm in catch rate was detected: encounters with bait seemed to be by chance. Habitat choice experiments revealed a kinetic preference for dark vs. light places, antipathy towards sand and a consistent choice of alternatives which offered high surface contact. Amphipods survived 4 ppt salinity for 30 min. Temperatures between -2 and +10 C were tolerated, but rapid removal from +2 C to +12 C resulted in heat shock effects. In the field, amphipods nestled into the pelt of the seal head, often near a facial orifice, and began penetration of the epidermis, creating larger and larger holes with time. Analysis of stomach contents showed that consumption of dark epidermal tissue only preceded white blubber, i.e. never followed it. The degree of stomach fullness of amphipods captured at night increased progressively through the hours of darkness. The rate at which stomach fullness declined with time depended on the material consumed: 9 to 10 d for seal epidermis, 2 d for blubber. Replete amphipods lose some 20% of total dry weight if starved for 23 d. (Auth. mod.)

B-51591

Gutt, J., Klages, M., *In situ* observations on the genus *Bathyplores* (Holothuroidea, Echinodermata) in Antarctica and its relevance to taxonomy, *Zoologica scripta*, 1991, 20(3), p.301-306, 36 refs.

Nineteen holothurian specimens were photographed or videotaped *in situ* on the deeper shelf of the Weddell Sea. These specimens show a different gradient and combinations of characteristics which are found in *Bathyplores rubipunctatus* Gutt, 1990. A close relationship to this species is therefore suggested. However, based on external features which are conspicuous in live animals but not visible in preserved material, they are classified into five groups. Further investigations will reveal whether these groups are distinct species or merely variants of *B. rubipunctatus*. (Auth.)

B-51593

Castello, M., Nimis, P.L., **Critical notes on antarctic yellow Acarosporaceae**, *Lichenologist*, 1994, 26(3), p.283-294, 21 refs.

All species of antarctic Acarosporaceae (including Biatorellaceae) with yellow thalli are revised. Four genera, *Acarospora*, *Biatorella*, *Biatorellopsis*, and *Eklundia*, and 10 species, all of them endemic, were previously reported from Antarctica. Results indicate that in Antarctica *Acarospora* subgen. *Xanthothallia* s. str. includes only 2 species, *A. gwynnii* Dodge and *A. flavocordia* sp. nov., *Biatorella* does not occur in Antarctica, the species described by Dodge belonging instead in *Candelariella*; the genus *Eklundia* is a synonym of *Candelariella*; *Biatorellopsis* does not occur in continental Antarctica, and the genus is a synonym of *Pleopsidium*; *Pleopsidium* is represented in Antarctica by one species, *P. chlorophanum*, which was treated under very different generic and specific names by earlier authors. Altogether, the number of species of yellow Acarosporaceae known from Antarctica is reduced from 10 to 3, distributed in 2 genera: *Acarospora* and *Pleopsidium*. The two *Acarospora* species, *A. gwynnii* and *A. flavocordia* are apparently endemic to Antarctica, whereas *P. chlorophanum* is a widespread bipolar lichen. A comprehensive list of synonyms and a key are provided. (Auth.)

B-51594

Wedin, M., **New and noteworthy lichenicolous fungi from southernmost South America**, *Lichenologist*, 1994, 26(3), p.301-310, 12 refs.

Abrothallus secedens Wedin & R. Sant. sp. nov., commensalistic on species of *Pseudocyphellaria*, from Argentina and Kenya and *Abrothallus granulatae* Wedin sp. nov., parasitic on *Pseudocyphellaria granulata*, from Argentina are described. *Vouauxiomyces granulatae* Wedin sp. nov. is regarded as the anamorph of *A. granulatae*. *Sphaerellothecium minutum* Hafellner is recorded for the first time from Antarctica and South America, *Phaeosporobolus alpinus* R. Sant., Alstrup & D. Hawksw. from Antarctica and Argentina. (Auth. mod.)

B-51598

Tankevich, P.B., **Growth and age of antarctic cod, *Notothenia rossii rossii*, on the Ob Bank (Indian Ocean sector of Antarctica)**, *Journal of ichthyology*, 1993 (Pub. Oct. 1994), 34(4), p.67-73, Translated from Voprosy ikhtiologii. 13 refs.

Data are given on the size-age composition of catches and the rates of growth and weight gain for the antarctic cod, *Notothenia rossii rossii*, in the vicinity of the Ob Bank. Length-weight relationship and parameters of growth according to the Bertalanffy equation are determined. Only adult sexually mature fish of this species reside on the Ob Bank. (Auth.)

B-51611

Lunn, N.J., Boyd, I.L., Croxall, J.P., **Reproductive performance of female antarctic fur seals: the influence of age, breeding experience, environmental variation and individual quality**, *Journal of animal ecology*, Oct. 1994, 63(4), p.827-840, Refs. p.838-840.

The reproductive performance of female antarctic fur seals was examined over 10 consecutive years (1983-92) at Bird I., South Georgia. The age at which females first gave birth varied from 3 to 6 years; over 90% of these females were 3 or 4 years of age. Age-specific reproductive rates increased rapidly from ages 2 to 6 years, reached a peak of 0.80 at 7-9 years, remained above 0.75 until 11 years and then began to decline with

increasing age. The mean duration of foraging trips in the current year (which was used as a measure of the availability of food resources) consistently improved models of the likelihood of pupping and of weaning success. When these trips were long (indicating reduced local food resources), females returned to the breeding beaches later, fewer females pupped, they gave birth to lighter pups and weaning success was reduced. The reproductive performance of older experienced antarctic fur seals was greater than that of younger inexperienced animals. (Auth. mod.)

B-51612

Grossmann, S., Dieckmann, G.S., **Bacterial standing stock, activity, and carbon production during formation and growth of sea ice in the Weddell Sea, Antarctica**, *Applied and environmental microbiology*, Aug. 1994, 60(8), p.2746-2753, 59 refs.

During initial ice formation, concentrations of bacterial cells in the order of 1×10^8 to 3×10^8 /liter were not enhanced within the ice matrix. This suggests that physical enrichment of bacteria by ice crystals is not effective. As soon as the ice had formed, the general metabolic activity of bacterial populations was strongly suppressed. Furthermore, the ratio of [^3H] leucine incorporation into proteins to [^3H] thymidine incorporation into DNA changed during ice growth. In thick pack ice, bacterial activity recovered and growth rates up to 0.6/day indicated actively dividing populations. However, biomass-specific utilization of organic compounds remained lower than in open water. Bacterial concentrations of up to 2.8×10^9 cells/liter along with considerably enlarged cell volumes accumulated within thick pack ice, suggesting reduced mortality rates of bacteria within the small brine pores. In the course of ice development, bacterial carbon production increased from about 0.01 to 0.4 microgram C/liter/h. In thick ice, bacterial secondary production exceeded primary production of microalgae. (Auth. mod.)

B-51613

Smith, J.J., Howington, J.P., McFeters, G.A., **Survival, physical response, and recovery of enteric bacteria exposed to a polar marine environment**, *Applied and environmental microbiology*, Aug. 1994, 60(8), p.2977-2984, 54 refs.

Survival, sublethal injury, and recoverability of *Escherichia coli*, *Enterococcus faecalis*, *Salmonella typhimurium*, and *Yersinia enterocolitica* were investigated by using diffusion chambers over 54 to 56 days of *in situ* exposure to a polar marine environment (-1.8 C; salinity, 34.5 ppt) at McMurdo Station. Plate counts were used to assess recoverability and injury, whereas direct viable counts (DVCs) and 5-cyano-2,3-ditolyl tetrazolium chloride (CTC) reduction were used to determine substrate responsiveness and respiratory activity, respectively. Sublethal injury was greater in populations of indicator bacteria than in pathogens. DVCs, CTC reduction, and plate counts indicated progressive increases in viable but nonculturable cells in *E. coli*, *S. typhimurium*, and *Y. enterocolitica* cultures throughout the 54-day exposure. Forty-eight day exposure of *E. coli*, *S. typhimurium*, and *Y. enterocolitica* resulted in decreased optimal incubation temperatures for colony formation and inability to form colonies at 37 C. Percentages of respiring *E. coli* and *S. typhimurium* increased significantly upon addition of nutrients at all temperatures tested, indicating that nutrient availability rather than temperature limited the enteric bacterial activity in this very cold environment. Large nutrient inputs to low-temperature marine environments may thus allow for long-term persistence of enteric bacteria in a nonrecoverable state. (Auth. mod.)

B-51616

Gambi, M.C., Lorenti, M., Russo, G.F., Scipione, M.B., **Benthic associations of the shallow hard bottoms off Terra Nova Bay, Ross Sea: zonation, biomass and population structure**, *Antarctic science*, Dec. 1994, 6(4), p.449-462, Refs. p.461-462.

Quantitative and semi-quantitative samples of phyto- and zoobenthic organisms were collected at 5 stations along a depth transect from 0.5-16 m on the shallow hard bottoms off Terra Nova Bay. The benthic associations were dominated by two macroalgal species, (*Iridaea cordata* and *Phyllophora antarctica*) and by few animal taxa (mainly polychaetes, molluscs and peracarid crustaceans). Distribution at the community and species levels revealed a well-defined zonation pattern as a function of depth, governed mainly by sea ice scouring and melting. Zonation of vagile fauna was also affected by the effects of covering and architecture of the two dominant macroalgae. Species richness and diversity were higher in the *Phyllophora* associated community, where habitat complexity and

sheltering were higher. The highest faunal abundance (over 82,000 ind/m²) and biomass (macroalgae and fauna wet weight 2392 g/m²) were recorded at 2 m depth in association with the *Iridaea* covering. The biomass values are among the highest recorded in shallow austral biotopes. An autoecological and demographic analysis of the most abundant animal species revealed for some species (e.g. *Laevitorina antarctica* and *Paramoera walkeri*) a quite complex population structure. (Auth. mod.)

B-51617

Gremmen, N.J.M., Huiskes, A.H.L., Francke, J.W., **Epilithic macrolichen vegetation of the Argentine Islands, Antarctic Peninsula**, *Antarctic science*, Dec. 1994, 6(4), p.463-471, Refs. p.470-471.

Classification of 162 sample plots of lichen vegetation from the Argentine Is. region yielded 2 main groups, the *Usnea* complex and the *Mastodia-Rinodina* complex, comprising 4 and 6 subordinate communities, respectively. Communities of the *Usnea* complex typically occur in inland sites with steep slopes, characterized by low chloride, ammonia and phosphate concentrations. Communities of the *Mastodia-Rinodina* complex occur close to the shore and in areas occupied by birds, where concentrations of chloride, ammonia and phosphate are relatively high. Within each vegetation complex species composition is related to factors indicating nutrient status (chloride and ammonia concentration, distance from the sea), as well as to variables indicating different microclimatic conditions (elevation, aspect, exposure, moisture, and gradient). In canonical correspondence analyses of the data a large part of species variation could not be explained by the environmental variables studied. It is suggested that temporal variability in mineral concentrations and the lack of information on differences in length of the growing season at the sample sites are, to a large extent, responsible for this. (Auth.)

B-51618

Guinet, C., Jouventin, P., Georges, J.Y., **Long term population changes of fur seals *Arctocephalus gazella* and *Arctocephalus tropicalis* on subantarctic (Crozet) and subtropical (St. Paul and Amsterdam) islands and their possible relationship to El Niño Southern Oscillation**, *Antarctic science*, Dec. 1994, 6(4), p.473-478, 21 refs.

The population trends over the last decade for subantarctic fur seals (*Arctocephalus tropicalis*) on Amsterdam and St. Paul islands and on Possession I. (Crozet Archipelago), and antarctic fur seals (*A. gazella*) are analyzed. At Amsterdam I., based on pup counts, the subantarctic fur seal population appears to have stabilized after a period of rapid growth. At Possession I., subantarctic fur seal and antarctic fur seal, with respective annual growth rates of 19.2 and 17.4%, are reaching the maximum growth rate for the genus *Arctocephalus*. Annual pup censuses at Possession I. since 1978 indicate important variations from year to year, with pup production for *A. gazella* significantly lower the year after an El Niño Southern Oscillation (ENSO) event, but with no such relationship for *A. tropicalis*. Several other long term demographic studies of seabirds and marine mammals at different breeding locations in the southern ocean indicate that the breeding success of several of these predators appears to be widely affected in years related to the ENSO events. (Auth. mod.)

B-51619

Siegel, V., Loeb, V., **Length and age at maturity of antarctic krill**, *Antarctic science*, Dec. 1994, 6(4), p.479-482, 14 refs.

Data from several summer research cruises in the Antarctic Peninsula region were analyzed to calculate length (L₅₀) and age at maturity for antarctic krill. Length at maturity L₅₀ is defined as the length at which 50% of the krill stock attains sexual maturity. L₅₀ values of 34.65-35.91 mm for female krill are the best estimates for the peak spawning season. Males attain sexual maturity later, at L₅₀ values of 43.35-43.71 mm. Length at maturity and length at first spawning are identical for krill. Comparisons with mean length-at-age data show that females mature in the third growth season (age class 2+), while males reach maturity in the fourth year (age class 3+). (Auth.)

B-51620

Vinocur, A., Izaguirre, I., **Freshwater algae (excluding Cyanophyceae) from nine lakes and pools of Hope Bay, Antarctic Peninsula**, *Antarctic science*, Dec. 1994, 6(4), p.483-489, Refs.

p.488-489.

Forty-eight freshwater algae (excluding Cyanophyceae) were identified from nine lakes and pools at Hope Bay, Antarctic Peninsula. The geographic distribution in Antarctica and the ecological characteristics of the sampling sites are given for each taxon. Sixteen of them, new records for Antarctica, are described and illustrated. Among the algal classes treated here, Bacillariophyceae and Chlorophyceae constitute the most diverse groups. Most of the species found have been recorded from Antarctica, and many of them are widespread. Some degree of polymorphism was observed in Bacillariophyceae and Tribophyceae taxa. (Auth.)

B-51638

Friedrich, C., Hagen, W., **Lipid contents of five species of notothenioid fish from high-antarctic waters and ecological implications**, *Polar biology*, Aug. 1994, 14(6), p.359-369, Refs. p.368-369.

Comprehensive data are presented on the total lipid contents of 5 species of notothenioid fish collected during summer 1991 in the Weddell Sea and the Lazarev Sea south of 69S. The species were selected based on their different modes of life, benthic, benthopelagic and pelagic, to examine how life style affects the proximate composition of these high-antarctic fishes. Lipid contents of whole specimens showed an extremely wide range from 3.1 to 67.5% of dry weight (%DW), with corresponding carbon/nitrogen (C/N) ratios between 3.4 and 11.3. Lowest lipid contents were found in the benthic species *Bathyraco marri* and *Dolloidraco longedorsalis* with means of 11.0 and 11.9%DW. The benthopelagic *Trematomus lepidorhinus* had an intermediate mean lipid content of 20.8%DW, and the pelagic species *Pleuragramma antarcticum* and *Aethotaxis mitopteryx* were richest in lipid with means of 47.0%DW and 60.8%DW. There was a pronounced ontogenetic lipid accumulation with increasing size discernible in the lipid-rich species, especially in *P. antarcticum*. The mode of life of these species was clearly reflected by their lipid contents; lipids seem to have an important function, particularly as buoyancy aids in the pelagic species, which like all notothenioids lack a swim-bladder. (Auth. mod.)

B-51639

Richard, K.J., Convey, P., Block, W., **Terrestrial arthropod fauna of the Byers Peninsula, Livingston Island, South Shetland Islands**, *Polar biology*, Aug. 1994, 14(6), p.371-379, Refs. p.378-379.

Fourteen micro-arthropod taxa (10 Acari, 4 Collembola) and 2 Diptera are recorded from Byers Peninsula, including the first record of the mite *Edwardzetes dentifer* from the maritime Antarctic. The first record of the midge *Belgica antarctica* from neighboring Snow I. is also given. Population composition and density were described in samples from a wide range of terrestrial and freshwater habitats. There was no strong relationship between habitat and micro-arthropod species occurrence, although comparison of completely vegetated and more stony sites revealed greater population densities at the vegetated sites, and different species proportions at each. Some individual samples contained a wide range of species with none achieving numerical dominance, whilst others from superficially similar sites were dominated by one species. Dipterans were limited to a small number of lakes, streams and seepage areas, where they were sometimes abundant. Population density data and species occurrence are compared with previously published studies from the maritime Antarctic and elsewhere. (Auth.)

B-51640

Kivi, K., Kuosa, H., **Late winter microbial communities in the western Weddell Sea (Antarctica)**, *Polar biology*, Aug. 1994, 14(6), p.389-399, Refs. p.398-399.

Microbial communities in the water column and sea ice were studied during the EPOS cruise on R/V *Polarstern* in the western Weddell Sea in late winter (Oct.-Nov. 1988). Samples were taken in 4 transects from heavy pack-ice to open water. The results indicated the important role of protozoans, especially in the ice-edge area. Heterotrophic nanoflagellates, dinoflagellates, ciliates and sarcodines showed significant positive correlations with chlorophyll *a*. Autotrophic picoplankton and autotrophic flagellates, which were probably motile zooids of *Phaeocystis pouchetii*, were most abundant in the areas of low to medium chlorophyll *a* concentration. Sea ice contained high numbers of heterotrophic organisms, and

the distribution of the different groups showed distinct vertical zonation. At two sites, the microbial assembly beneath the ice was clearly influenced by communities from the melting ice. (Auth.)

B-51641

Pugh, P.J.A., Dartnall, H.J.G., **Acari of fresh- and brackish water habitats in the antarctic and sub-antarctic regions**, *Polar biology*, Aug. 1994, 14(6), p.401-404, Refs. p.403-404.

Neither the benthic Halacaroidea nor nektonic Hydrachnida, characteristic of temperate and tropical freshwater mite faunas, are represented among the 24 species and sub-species of Acari recorded from the Antarctic and Subantarctic. The mites collected from the streams, lakes or brackish/freshwater pools of the region are either terrestrial species blown by wind into freshwater or interlopers from the marine littoral which have invaded coastal brackish pools. Published records for the region are reviewed and the combined "fauna" is then compared with that of temperate and tropical regions. (Auth. mod.)

B-51642

Gleitz, M., Bathmann, U.V., Lochte, K., **Build-up and decline of summer phytoplankton biomass in the eastern Weddell Sea, Antarctica**, *Polar biology*, Aug. 1994, 14(6), p.413-422, Refs. p.421-422.

The seasonal development and decline of phytoplankton was investigated in the eastern Weddell Sea during summer and fall, 1991. During the first half of the study, favorable irradiance/mixing regimes initiated net phytoplankton growth in ice-free waters on the shelf and in stretches of open water over the partially ice-covered deep ocean. Chl *a* concentrations in the upper water column were moderate, but significantly above winter values. Bacterial biomass and productivity generally paralleled the seasonal development of the phytoplankton. Nitrate concentrations in the upper mixed layer were substantially lower than would be expected from the existing phytoplankton standing stock, suggesting that heterotrophic consumption of organic matter by bacteria and zooplankton removed a large fraction of the primary production. The shallow seasonal pycnocline was eventually eroded by the passage of a storm, resulting in a homogeneous distribution of phytoplankton biomass over the entire water column, followed by sedimentation and deposition of phytodetritus on the sea floor. (Auth. mod.)

B-51643

Watanuki, Y., Mori, Y., Naito, Y., ***Euphausia superba* dominates in the diet of Adélie penguins feeding under fast sea-ice in the shelf areas of Enderby Land in summer**, *Polar biology*, Aug. 1994, 14(6), p.429-432, Refs. p.431-432.

Adélie penguins in Enderby Land feed mainly on *Euphausia superba* during the chick-rearing season in shelf areas where fast sea-ice remains, indicating that *E. superba* is abundant under the fast sea-ice in these areas. The shelf areas in Enderby Land therefore are unique, since the previous studies of Adélie penguin diet in the Ross Sea, Adélie Coast and Prydz Bay show that *E. crystallorophias* is the most abundant krill species in shelf areas in general. (Auth.)

B-51644

Kaup, E., **Annual primary production of phytoplankton in Lake Verkhneye, Schirmacher Oasis, Antarctica**, *Polar biology*, Oct. 1994, 14(7), p.433-439, Refs. p.438-439.

Algal carbon 14 fixation, photosynthetically active radiation (PAR), temperature and nutrients were measured from Mar. 1976 to Jan. 1977 and from Nov. 1983 to Feb. 1984 in Lake Verkhneye, a small freshwater lake. As a consequence of the minute meltwater input, the PAR extinction coefficient was very low, ranging between 0.04 and 0.12/m throughout the year. Low extinction combined with the transparent and mostly snowless ice cover resulted in high noon PAR intensities in the lake from Nov. to Jan. As a result of the small annual total phosphorus loading, phosphate concentration in the main water mass did not exceed 0.03 mmol/m³ during most of the growing season. Phytoplankton assimilation rates were very low in Dec. The annual net primary production was 0.58 gC/m², the lowest value on record. These low levels were due to photoinhibition and phosphorus limitation. (Auth. mod.)

B-51645

Morrice, M.G., Burton, H.R., Green, K., **Microgeographic variation and songs in the underwater vocalisation repertoire of the Weddell seal (*Leptonychotes weddellii*) from the Vestfold Hills, Antarctica**, *Polar biology*, Oct. 1994, 14(7), p.441-446, Refs. p.446.

Recordings of underwater vocalizations of the Weddell seal were made in fjords of the Vestfold Hills. The repertoire was examined for the presence of microgeographic variation. Recordings covered the period from the end of mating to the beginning of the moult in the 1989-1990 breeding season. The repertoire was classified into 44 vocalization types using a classification method based on objective parameters. Unique vocalizations were identified at each site, with 48% exclusive to Long Fjord and 41% to Tryne Fjord. A small percentage (11%) of the repertoire was common to both fjords, reflecting the limited observed interchange of individuals between these populations due to their strong breeding site fidelity. Seven male songs are described in the present study; these possibly function to maintain underwater territories. (Auth.)

B-51646

Daponte, M.C., Esnal, G.B., **Differences in embryological development in two closely related species: *Ihlea racovitzai* and *Ihlea magalhanica* (Tunicata, Thaliacea)**, *Polar biology*, Oct. 1994, 14(7), p.455-458, 19 refs.

Differences in the early stages of embryological development confirm the validity of the closely related salp species *Ihlea racovitzai* and *Ihlea magalhanica*. In the latter, 8-12 oocytes and hence 8-12 follicles and uterine sacs are observed in the ovary; however, most of them undergo a progressive degradation and only two embryos complete their development. In *I. racovitzai* two embryos also develop but from the very beginning only the two successful follicles are found. (Auth.)

B-51647

Moen, J., MacAlister, H., **Continued range expansion of introduced reindeer on South Georgia**, *Polar biology*, Oct. 1994, 14(7), p.459-462, 13 refs.

Reindeer were introduced 70 years ago to the Stromness Bay area on the subantarctic island of South Georgia, and the herd is still surviving. Two glaciers confine the herd, and movements are restricted even within the area due to a rugged topography. The Husvik herd has recently expanded its range within this area, and today approximately 88% of the vegetated area is affected by grazing. The grazing effects are described, and the value of the introduction as a natural experiment is discussed. (Auth.)

B-51648

Davidson, W., Franklin, C.E., McKenzie, J.C., **Haematological changes in an antarctic teleost, *Trematomus bernacchii*, following stress**, *Polar biology*, Oct. 1994, 14(7), p.463-466, 19 refs.

The effect of an acute increase in temperature, exhaustive exercise and hypoxia on the haematology of the benthic antarctic teleost *Trematomus bernacchii* was investigated. High temperature and hypoxia caused the biggest changes to the blood, with increases in haematocrit, haemoglobin concentrations and plasma chloride levels. The spleen decreased in mass. Exercise produced the smallest changes. Changes were substantially less than reported for the more active cryopelagic species *Pagothenia borchgrevinki*. The magnitude of the haematocrit increase is discussed in relation to life-style of fish living in the Antarctic. (Auth.)

B-51649

Skinner, J.D., Klages, N.T.W., **On some aspects of the biology of the Ross seal *Ommatophoca rossii* from King Haakon VII Sea, Antarctica**, *Polar biology*, Oct. 1994, 14(7), p.467-472, Refs. p.471-472.

A total of 29 female and 11 male Ross seals were sampled in Jan. over three years. Seals were weighed, measured and age determined by counting dentine lines in teeth. Stomach contents were identified against reference material, and species of helminths were determined using standard techniques. Asymptotes in body mass and length are reached at some nine years of age. Age class varied from 2-20 years. Antarctic silverfish *Pleurogramma antarcticum* was the only fish species identified. *Psychro-*

teuthis glacialis dominated the squid component. Fish was dominant in three samples, squid was the exclusive component in two samples and a minor component in another two. *Glandicephalus antarcticus*, *Diphyllbothrium wilsoni* and *Contracaecum* spp. were the dominant helminths present. The high proportion of empty or nearly empty stomachs conforms with the knowledge that this species moults and consequently fasts in Jan. (Auth.)

B-51650

Frenot, Y., Gloaguen, J.C., **Reproductive performance of native and alien colonizing phanerogams on a glacier foreland, Iles Kerguelen**, *Polar biology*, Oct. 1994, 14(7), p.473-481, Refs. p.481.

The retreat of the Ampère Glacier on Kerguelen has left wide ice-free areas where 5 native and 2 alien vascular plant species are involved in primary colonization. The number of seeds produced by individual fertile plants has been determined for each species and germination capacity has been tested under different temperature and light conditions. *Colobanthus kerguelensis* and *Cerastium fontanum* produced the highest number of seeds per plant. No dormancy mechanism occurred in either species and they appeared to be the most successful colonizers during the early stages following the deglaciation. No seeds of *Azorella selago* and *Agrostis magellanica* had germinated after 2 months. Dormancy was demonstrated only in *Poa kerguelensis*. *Festuca contracta* was the only species which exhibited a negative photosensitivity. Germination of indigenous seeds required relatively high temperatures, whereas the optimum temperature for germination in the introduced *Poa annua* was 10 C. (Auth. mod.)

See also:

A-49930 A-50318 D-51309 E-49511 E-49664 E-49670 E-49671
E-49771 E-49781 E-49794 E-49801 E-49824 E-49825 E-49837
E-49838 E-49995 E-50011 E-50125 E-50128 E-50132 E-50134
E-50136 E-50246 E-50247 E-50248 E-50249 E-50250 E-50251
E-50252 E-50253 E-50254 E-50262 E-50268 E-50269 E-50274
E-50275 E-50337 E-50406 E-50407 E-50431 E-50469 E-50493
E-50635 E-50640 E-50641 E-50695 E-50803 E-51002 E-51075
E-51087 E-51110 E-51118 E-51120 E-51121 E-51122 E-51164
E-51297 E-51325 E-51326 E-51327 E-51328 E-51329 E-51330
E-51332 E-51333 E-51334 E-51335 E-51336 E-51337 E-51338
E-51339 E-51340 E-51341 E-51342 E-51343 E-51344 E-51345
E-51347 E-51355 E-51356 E-51358 E-51360 E-51364 E-51365
E-51423 E-51468 E-51607 F-49780 F-50867 F-50928 F-50977
F-51068 F-51320 G-51291 G-51397 I-49836 I-50313 I-50387
I-50580 I-50609 I-50612 I-50614 I-51556 J-49635 J-49636
J-49637 J-49708 J-49993 J-50057 J-50062 J-50063 J-50067
J-50070 J-50071 J-50121 J-50124 J-50129 J-50192 J-50340
J-50342 J-50343 J-50410 J-50413 J-50427 J-50428 J-50429
J-50443 J-50446 J-50454 J-50530 J-50561 J-50649 J-50717
J-50833 J-50836 J-50847 J-50990 J-51022 J-51023 J-51030
J-51042 J-51048 J-51050 J-51051 J-51076 J-51132 J-51136
J-51143 J-51145 J-51146 J-51415 J-51473 J-51558 J-51580
J-51614 J-51615 M-49759 M-50295 M-50825 M-50853 M-51115
M-51550

C. CARTOGRAPHY

C-49546

Kikuchi, T., Shibata, A., Wakatsuchi, M., **Preliminary study on Geosat altimeter observation in the southern ocean**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1993, p.41-50, 16 refs.

The Geosat sea-level anomaly in the southern ocean from Nov. 1986 to Dec. 1987 is calculated by applying the collinear method to retrieve sea-level from Geosat altimeter data. Geosat sea-level data are used to investigate the variation and time-dependency of the sea-level anomaly in the southern ocean. Regions with high variability in sea-level anomaly correspond to the confluence zones of subtropical and subantarctic water and to the Antarctic Circumpolar Current (ACC). Two regions with higher variability exist in the ACC. High variability south of New Zealand is closely related to the bottom topography. The sea-level anomaly in this region does not show a clear propagation signal, while the strong anomaly generated in Drake Passage propagates downstream at a speed of 4.5 cm/s. (Auth. mod.)

C-49580

Jezek, K.C., ed, Carsey, F.D., ed, **RADARSAT: The Antarctic Mapping Project. Proceedings of the Science Objectives and Requirements Meeting**, Byrd Polar Research Center. Report, 1993, BPRC No.6, 24p., 13 refs.

On Mar. 30, 1993 a meeting was convened at the Byrd Polar Research Center of The Ohio State University to discuss plans for the complete imaging of Antarctica with a synthetic aperture radar to be carried aboard the Canadian Radarsat. This report summarizes the outcome of the science meeting. Participants were briefed on potential science applications of RADARSAT data based on experience gained with the first European Remote Sensing Satellite (ERS-1). An in-depth review of RADARSAT system attributes was also presented. Current estimates of data volume were presented and key data acquisition issues were discussed. Science objectives for the project were listed and discussed. Of most importance, requirements on mapping, mosaicking and database formation were identified based on the science objectives. Finally, ancillary research to be conducted before and after launch was debated. The kind of ancillary research reviewed included prelaunch measurements of surface backscatter to constrain possible imaging geometries, and post-launch validation and geolocation campaigns.

C-49761

Bridger, J.F.D., **Incomplete topographic mapping of Laurie Island, South Orkney Islands**, *Polar record*, Jan. 1994, 30(172), p.43-46, 18 refs.

The explanation of Laurie I.'s incomplete mapping involves a wide range of factors. The salient points include the following: the failure of the 1902-1904 Scottish National Antarctic Expedition to publish a relief map because of the loss of their theodolite at an early stage of the survey; neglect of Laurie I. topographic mapping by Argentines who have manned Orcadas station since 1903; political constraints placed upon British activity on Laurie I. in the dozen years preceding the 1959 Antarctic Treaty; and the unsuitability for heighting purposes of the Landsat imagery used in the recent Laurie I. map compilation. (Auth. mod.)

C-49834

Brodscholl, A.L., Herzfeld, U.C., Sandwell, D.T., **Comparison between satellite gravity data (GEOSAT) and marine gravity data measured in the Weddell Sea, Antarctica**, From Mars to Greenland: charting gravity with space and airborne instruments—fields, tides, methods, results. Edited by O.L. Colombo, New York, Springer-Verlag, 1992, p.129-138, 15 refs.

DLC QE330.E76

The objective of this study is the analysis and comparison of gravimetric and bathymetric data from antarctic expeditions with R/V *Polarstern* and from satellite altimetry data from the Geosat Geodetic Mission, using methods from geostatistics and geophysical inverse theory. High-resolution gravity and bathymetric maps resulting from geostatistical evaluation of shipboard data reveal detailed structures of the Andenes Explora Escarpment in the Weddell Sea. The structures of Wegener Canyon and other more prominent features appear with surprisingly good correlation also in the evaluation of Geosat data (which have much less resolution but cover larger areas). The good correspondence among the three data types is supported by results from spectral analysis and multivariate geostatistical analysis, indicating high covariation between satellite gravity data and shipboard gravity data, and to a lesser extent bathymetric data, down to 20 km wavelength. (Auth.)

C-50449

Eymard, L., Le Cornec, A., Tabary, L., **ERS-1 microwave radiometer**, *International journal of remote sensing*, Mar. 10, 1994, 15(4), p.845-857, 32 refs.

The microwave radiometer on board ERS-1 developed at Centre de Recherche en Physique de l'Environnement (CRPE) has channels at 23.8 and 36.5 GHz. It is a nadir pointing sensor, aimed at the correction of the altimeter tropospheric path delay. It also provides the precipitable water and cloud liquid water over oceans along the satellite track. The measured brightness temperatures can be used to characterize polar ice and land surface properties. The paper summarizes the characteristics of the instrument, describes the scientific requirements for data processing and presents its first results after launch, including brightness temperature measurements acquired during aerial surveys of Antarctica. (Auth. mod.)

C-50450

Bamber, J.L., **Ice sheet altimeter processing scheme**, *International journal of remote sensing*, Mar. 10, 1994, 15(4), p.925-938, 10 refs.

The philosophy behind the processing (for the U.K.-Earth Observation Data Centre) of altimeter data over ice sheets and shelves is explained and a description of the function and performance of the algorithms used is provided. The methods available for waveform retracking and slope correction, which represent the primary difference between ocean and land altimeter data analysis, are discussed in detail. Results from their operation with Seasat altimeter data and a simulated surface profile are provided to indicate their likely performance with ERS-1 data. The contents and structure of the ice sheet data product are described and its intended applications discussed. Future modifications and calibration/validation of the data are also considered. Seasat profiles of Wilkes Land and Amery Ice Shelf are used to test retracking algorithms. (Auth. mod.)

C-50502

Thyssen, F., Bombosch, A., Sandhäger, H., **Elevation, ice thickness and structure mark maps of the central part of the Filchner-Ronne Ice Shelf**, *Polarforschung*, 1992 (Pub. 1993), 62(1), p.17-26, 8 refs.

Improved maps of surface elevation, total ice thickness and meteoric ice thickness have been plotted using digital data obtained by airborne electromagnetic reflection (EMR) sounding during the course of three expeditions to the central part of Filchner-Ronne Ice Shelf (FRIS). These data have also been used to map the shape and the thickness of an extensive layer of marine ice located below the meteoric ice and to classify structures within the ice shelf by their appearance in the EMR records. The aerial distribution of these structures has been plotted in another map. The correlation of the results shown in the different maps has helped to improve the understanding of the complex glaciological situation within the central part of FRIS. In addition, the extensive data net forms a reasonable base for further modeling work on a double-layered ice shelf. (Auth.)

C-50665

Chou, J., et al, **Segmentation of polar scenes using multi-spectral texture measures and morphological filtering**, *International journal of remote sensing*, Mar. 20, 1994, 15(5), p.1019-1036, 39 refs.

Two segmentation and two unsupervised classification schemes are applied to four Landsat TM antarctic scenes of sea ice surface conditions. The methods include the region-growing and the region-oriented segmentation approaches and the Divide-and-Conquer and the Mahalanobis classifiers. Combinations of spectral signatures and Grey Level Difference Vector textural measures are computed for each of the seven TM bands. Correlation matrices then are constructed to reduce the feature vector. Means, standard deviations, and angular second moments are selected, usually for TM channels 4, 5, and 6. In general it is found that the segmentation schemes produce results which are judged to be more reliable and useful than those obtained from the classification schemes. The region-oriented segmentation approach is found to produce the best results. The morphological three-dimensional opening and closing operators are used as a preprocessing step in both the segmentation and classification approaches. It is found that a 7 by 7 pixel structuring element is most effective in improving both segmentation and classification results in highly complex scenes. The closing operator provides smoother boundaries between regions and more uniform regions, reducing both noise and insignificant small regions from otherwise uniform large regions. On the other hand, the opening operator is found to be effective in identifying individual ice floes within a background of broken sea ice. (Auth. mod.)

C-50689

Scott, R.F., et al, **Comparison of the performance of the ice and ocean tracking modes of the ERS-1 radar altimeter over non-ocean surfaces**, *Geophysical research letters*, Apr. 1, 1994, 21(7), p.553-556, 16 refs.

The European Space Agency's ERS-1 radar altimeter is the first to include separate operating modes to optimize performance over both ocean and non-ocean surfaces. As part of the ERS-1 commissioning activities, a study of the tracking performance of this instrument over non-ocean surfaces, including Greenland and Antarctica, has been implemented. Statistics for land ice, sea ice, arid lands, and inland water are presented. Performance in both operating modes is shown to be better than that of previous missions. (Auth. mod.)

C-50708

Harding, D.J., Bufton, J.L., Frawley, J.J., **Satellite laser altimetry of terrestrial topography: vertical accuracy as a function of surface slope, roughness, and cloud cover**, *IEEE transactions on geoscience and remote sensing*, Mar. 1994, 32(2), p.329-339, 23 refs.

Satellite laser altimetry provides a method to obtain global digital topographic data of high accuracy by measuring the round-trip time-of-flight of laser pulses reflected from the Earth's surface. Analysis of the sensitivity of laser ranging errors to surface conditions indicates that predicted single-shot range errors are primarily dependent on surface slope. Range errors are less sensitive to variations in surface roughness or reflectivity. Averaging of multiple laser measurements improves the vertical accuracy of the elevation data by statistical reduction of random errors. During a three-year mission, two to three laser measurements will be acquired, on average, for each 200 m footprint at low to moderate latitudes, accounting for the latitudinal variation of ground track spacing and cloud cover. For high-latitude regions, the narrow spacing of satellite ground tracks in a polar orbit will provide frequent repeat observations yielding, on average, 4 to 25 measurements of each footprint over the antarctic and Greenland ice sheets. Averaging of these multiple repeat observations at high latitude will yield an improvement in vertical accuracy by a factor of two to five. (Auth. mod.)

C-50791

Fortunati, L., Mazzarini, F., Basile, P., **Automatic cartography of northern Victoria Land (Antarctica) from digital data with raster/vector integration**, *Terra Antarctica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.100-103, 7 refs.

This paper presents the authors' experience in the integration of raster and vector data in the restitution phase of a geographic information processing system: the result, obtained on a color electrostatic plotter, is the combination of a satellite image as the background and one or more thematic layers of information as the overlay. The final product obtained with this methodology is the realization of two topographic maps: these are relative to the Mt. Melbourne area (Victoria Land) and represent the satellite image overlain in the first one by the contour lines and in the second one by the geological boundaries and the structural features (faults). (Auth. mod.)

C-50954

Hagen, R.A., et al, **Applied marine geodetic research in polar regions**, *Marine geodesy*, Apr.-June 1994, 17(2), p.81-94, 11 refs.

At the Alfred Wegener Institute for Polar and Marine Research, several geodetic methods are used to map the seafloor in polar regions. Multi-beam bathymetric surveys are regularly conducted in polar regions by the institute's icebreaker *Polarstern*. These multibeam data are combined with bathymetric data from other sources to create bathymetric maps. The Hydrosweep multibeam system in the *Polarstern* is presently being modified to have a wider survey swath and the ability to collect sidescan and backscatter data. These modifications will enable researchers to survey the seafloor more efficiently and will provide important information about seafloor materials. Satellite altimetry data are also used to supply the correlation between the earth's geopotential field and the seafloor topography. This correlation can be used to guide bathymetric contouring in areas with little or no bathymetric data. Current efforts involve the study of ERS-1 altimetry data from the Weddell Sea where altimetry data are being used to aid bathymetric mapping. (Auth. mod.)

C-50993

Fox, A.J., Cooper, A.P.R., **Measured properties of the antarctic ice sheet derived from the SCAR Antarctic digital database**, *Polar record*, July 1994, 30(174), p.201-206, 13 refs.

The completion of the SCAR Antarctic digital database (ADD) has provided a new basis for statistical calculations for Antarctica. Data-sets are available at the scale of the original source material, and generalized to 1:1,000,000, 1:3,000,000, 1:10,000,000, and 1:30,000,000. The new descriptive statistics presented are based on the ADD 1:1,000,000 data-set since this is the largest scale at which source maps provided complete cover of the coastline and ice-free areas. The statistics include the total length and proportions of coastline types and the total area of Antarctica with the proportions of its constituent feature types. The areas of the Ross and Filchner-Ronne ice shelves have also been computed. Whilst the total area of Antarctica has remained static compared with previous studies, the relative proportions of coastline types and constituent feature types within the total area show significant changes. In particular the calculated area of ice-free ground is only about one-seventh of that often quoted from previous studies. The changes reported result from improved mapping, reinterpretation of data, and actual changes of coastline. (Auth.)

C-51035

Frouin, R., et al, **Aircraft photopolarimetric observations of the ocean, ice/snow, and clouds in coastal regions of the Antarctic Peninsula**, *Antarctic journal of the United States*, 1992, 27(5), p.187-190, 10 refs.

During the 1991-1992 RACER cruise, aircraft photopolarimetric observations were made with an ocean color imager, the Polarization and Directionality of the Earth's Reflectance (POLDER) instrument. The ability of POLDER to measure spectral, bidirectional, and polarization characteristics as reflected sunlight, as well as its dynamic range, high spatial resolution, and the good quality of the data acquired during the cruise, offer the opportunity to investigate many aspects of ocean color remote sensing in a highly productive, yet not easily accessible environment where the presence of ice introduces further difficulty. Optical properties of ice, snow, and clouds can be characterized and compared. The dataset is unique, and one of the very few existing on polarization characteristics of natural surfaces.

C-51139

Waters, K.J., Smith, R.C., **Palmer LTER: A sampling grid for the Palmer LTER program**, *Antarctic journal of the United States*, 1992, 27(5), p.236-239, 1 ref.

The Palmer LTER site is centered near Palmer Station, Anvers I. mid-way down the Antarctic Peninsula and will include a long-term comprehensive measurement program of this ice dominated system. Like other LTERs, the Palmer LTER will investigate phenomena that occur on time scales of years to decades in order to separate long-term (decadal) systematic trends from interannual variability in physical conditions and populations. In order to structure the long-term monitoring the authors created a sampling grid analogous to the well-known CalCOFI grid along the west coast of North America. The PalLTER grid is west of the Antarctic Peninsula and covers an area of 900 km (roughly parallel to the peninsula) by 200 km (on- to offshore). Within this grid, cardinal lines spaced every 100 km along the peninsula and cardinal points spaced every 20 km on to offshore will comprise basic sampling stations. Imbedded within this large-scale or peninsula grid is a finer-scale grid specific to the immediate area of Palmer Station.

C-51192

Salvini, F., della Maggiore, R., Fortunati, L., Mazzarini, F., **Rock mapping of glaciated areas of satellite image processing**, *Polar research*, June 1994, 13(1), Circumpolar Symposium on Remote Sensing of Arctic Environments, 2nd, Tromsø, Norway, May 4-6, 1992. Proceedings, p.23-33, 18 refs.

A model is presented that performs spectral deicing of mixed pixels in satellite images of glaciated areas. The model was tested in Northern Victoria Land. Naturally mixed ice and rock pixels are present in satellite images; these were recomputed to separate the spectral component related to the rock fraction. Landsat TM images were used as input data and aerial photographs, maps and field surveys as reference data. By making use of sample populations of pixels corresponding to pure ice and to pure rock groundels (i.e. ground elements, the ground portions corresponding to each pixel), the linear correlations between pairs of bands were detected and the two most suitable bands selected. For every pixel falling between the correlation lines of the two categories, the rock fraction in the corresponding groundel was computed. In the utilized antarctic image, this process increases by about 2.7 times the number of pixels in the pure rock category, allowing the production of enhanced images and, as a side product, a thematic map of rock percentage in the groundels. (Auth. mod.)

C-51310

Heidland, K., **Satellite altimetry over ice—application of the GEOSAT altimeter over the Ekström Ice Shelf, Antarctica** [Satellitenaltimetrie über Eis—Anwendung des GEOSAT-Altimeters über dem Ekströmisen, Antarktis], *Berichte zur Polarforschung*, 1994, No.141, 144p., In German with English and German summaries. Refs. p.125-137.

In this thesis, radar altimeter measurements over ice sheets carried out by the satellite GEOSAT between 1987 and 1989 are analyzed for the Ekström Ice Shelf. The altimeter was designed specifically for operation over the ocean; signal tracking over ice sheets is often insufficient. The altimeter loses the signal over ice sheets with more than 1 deg slope of the ice surface and the consequence is data gaps. The plausibility control of the GEOSAT data indicates that 15% of all measurements in Antarctica are valid especially over flat ice sheets. Valid measurements over Ekström Ice Shelf are concentrated in the flat western part. The accuracy of the height of the satellite orbit directly affects the accuracy of the height profiles. The adjustment uses the exact repeating satellite orbits for the computation of an additional constant for every height profile. The improved height profiles are used for the adjustment of an averaged height profile. The accuracy of the height profiles is given by the root mean square which is determined by the adjustment at 0.8 +/- 0.5 m. The remaining differences after the adjustment between the height profiles and the crosspoints of the ascending and descending satellite orbits vary in the range between 0.5 and 3.0 m. The footprint over ice has a diameter of more than 5 km. The variation of the surface heights inside the footprint can be a few meters. (Auth. mod.)

C-51403

Mullen, R.R., Mullins, J.L., **Surveying and mapping in Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.342-343.

The U.S. Geological Survey (USGS) Antarctic Surveying and Mapping Program focused its activities during the 1991-1992 season on the acquisition of global positioning system (GPS) geodetic mapping control, Doppler satellite surveying, seismology, Doppler satellite tracking, and an international GPS campaign. During the 1991-1992 field season the USGS's geodetic control crews employed GPS positioning as the means of establishing geodetic mapping control in Antarctica. In Jan. 1992 the USGS team conducted a geodetic survey to establish the position of the true South Pole marker at Amundsen-Scott Station. Based on this season's observations and data from previous surveys, it was found that the ice sheet at South Pole continues to move approximately 10 m per year in a northwesterly direction. The team installed a permanent brass marker identifying the 1991-1992 austral summer position.

C-51484

Sievers, J., **Thematic map series 1:2,000,000 Filchner-Ronne Schelfeis, Filchner-Ronne Ice Shelf Programme (FRISP)**. Report, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.1-8.

DLC G890.F55R47 No.7 1994

The concept of this mapping project was put forth at the 5th FRISP workshop in 1990. Since then two thematic maps have been published: MAP 2: Satellite image map, 1992; and MAP 3: Topographic Map, 1993. A map issued in 1987 on the glaciology of the region was designated as MAP 1 of the series. Planned for issuance between 1994 and 1996 are four others: MAP 4: Seabed and bedrock topography; MAP 5: Ice thickness map; MAP 6: Topographic map (2nd edition); and MAP 7: Glaciological map (2nd edition).

C-51485

Ihde, J., Eck, J., Reinhold, A., Schirmer, U., **Digital terrain model in the Filchner Ronne Ice Shelf derived from ERS-1 radar altimeter data**, *Filchner-Ronne Ice Shelf Programme (FRISP)*. Report, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.9-15, 10 refs.

DLC G890.F55R47 No.7 1994

The first results of the derivation of orthometric heights (sea heights) for ice sheets of the Filchner Ronne Ice Shelf area from ERS-1 radar altimeter data up to latitude 82S are presented. An algorithm for profile adjustment of repeated observations along the ERS-1 subsatellite track is developed. Analysis of the ERS-1 radar altimeter measurements of the 35-day repeat cycle shows a high potential of accuracy and resolution for the determination of ice sheet elevations. The result is a slope-corrected digital terrain ice model. (Auth.)

C-51490

Vaughan, D.G., **Glacier geophysics fieldwork on Ronne Ice Shelf in 1992/93**, *Filchner-Ronne Ice Shelf Programme (FRISP)*. Report, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.37-38, 3 refs.

DLC G890.F55R47 No.7 1994

A series of glaciological investigations was performed during the austral summer of 1992/93 on Rutford Ice Stream and Ronne Ice Shelf, including GPS profiling over the crest of Fletcher Ice Rise; investigation of tidal flexing at the grounding line of Rutford Ice Stream; remeasurement of six velocity and strain rosettes on Ronne Ice Shelf; measurement of elevation profile along the predicted track for ERS-1 between Ronne Ice Shelf and Fletcher Ice Rise; measurement of the elevation profile through the buckling zone upstream of Korff Ice Rise; and downloading of data from transistors installed at the 1990 hot-water drill sites.

C-51597

Rémy, F., Minster, J.F., Femenias, P., **Monitoring continental ice sheets by satellite altimetry**, *Advances in space research*, Nov. 1993, 13(11), p.(11)353-(11)359, 32 refs.

Altimeter data are helpful in monitoring the evolution of polar caps as well as in constraining their dynamics. In recent years the authors have quantified the impact of the so-called volume echo in the determination of

the surface height, analyzed the effect of surface roughness on the intensity of the radar signal, adapted an inverse technique for mapping the topography of the ice sheets and its error, including correction of the surface slope effect and, finally, used the antarctic ice sheet topography deduced from Seasat data to estimate the rheological parameters of the ice flow. (Auth.)

See also:

A-51483 E-50175 E-51438 F-49632 F-49723 F-49814 F-50105
F-50141 F-50153 F-50154 F-50155 F-50156 F-50158 F-50160
F-50161 F-50162 F-50163 F-50165 F-50166 F-50169 F-50172
F-50204 F-50206 F-50208 F-50210 F-50211 F-50213 F-50214
F-50215 F-50629 F-50667 F-50955 F-51107 I-49702 I-49751
I-50613 J-50059 J-50171 J-50334 J-50453 J-50454 J-50860
J-51140 J-51229 J-51406 J-51586 L-49835 L-49901 L-50176

D. EXPEDITIONS

D-49509

Alam, I.A., Sadiq, M., **Metal concentrations in antarctic sediment samples collected during the Transantarctica 1990 Expedition**, *Marine pollution bulletin*, Sep. 1993, 26(9), p.523-527, 1 ref.

In 1989, an International Trans-Antarctic expedition was planned involving Saudi Arabia, France, the United Kingdom, the United States, China, Japan, and the USSR. A research program was designed to investigate metal concentrations in sediments from the antarctic region. Sediment samples were collected from 8 locations. All samples were collected from tidal areas by scooping a few cm of the top sediment layer into plastic containers. Concentrations of barium (Ba), cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), phosphorus (P), lead (Pb), nickel (Ni), strontium (Sr), titanium (Ti), vanadium (V), and zinc (Zn) were determined in the aliquots using an inductively coupled argon plasma analyzer (ICAP).

D-49744

Funatsu, K., **Crossing of Antarctica by dog sleds, 1989-90**, *Polar news*, Aug. 1992, No.55, p.71-75, In Japanese.

This is a personal account by the Japanese member of the 6 man (Japanese, U.S., French, former Soviet, British, and Chinese) International Trans-Antarctica Expedition, July 27, 1989-Mar. 3, 1990. The expedition covered 6040 km in 220 days, from Seal Nunataks at the tip of the Antarctic Peninsula, via Amundsen-Scott Station at the South Pole, to Mirny Station on the coast of East Antarctica, by ski and dog sled, with 3 tents, 3 sleds, and 36 dogs. The hazards of cold, snow, wind, and crevasses, and how the experience of traveling through a hostile but beautiful and pristine environment impressed the need to protect the global environment and promote world peace, are described.

D-49922

Kokubun, S., **Activities of the summer party of the 32nd Japanese Antarctic Research Expedition in 1990-1991**, *Antarctic record*, Nov. 1993, 37(3), p.277-290, In Japanese with English summary.

The 32nd Japanese Antarctic Research Expedition (JARE-32, 1990-1991) consisted of 55 members including 31 in the wintering party at Showa Station, 8 in the wintering party at Asuka Station and 16 in the summer party, including 2 Belgian glaciologists. The icebreaker *Shirase*, loaded with about 950 t of cargo, left Tokyo for Antarctica on Nov. 14, 1990. The following scientific activities were carried out during the summer operations of JARE- 32: geological, geomorphological, geodetic and glaciological surveys in the Sør Rondane Mountains region; biological and oceanographic observations and gravity measurements in the Showa Station area and at Breid Bay; meteorological, oceanographic, geomagnetic and ionospheric observations and gravity measurements on board the *Shirase*; and two balloon flights for observations of magnetic field, electric field and auroral X-rays. (Auth. mod.)

D-50409

Comerci, S.M., **Two Argentine antarctic expeditions** [Dos expediciones argentinas a traves de los Antartandes], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1993, No.418, 40p., In Spanish. 18 refs.

An account is given of two Argentine antarctic expeditions along the Antarctic Peninsula: one in 1952, from San Martin Station in Marguerite Bay to the Weddell Sea, and the other from Hope Bay to Marguerite Bay, ten years later. The different stages and logistics of the expeditions are described, with details regarding local geography and history of discovery of places en route and emphasis on the role the Argentine Navy and Army played in the latter. The different fields in which scientific observations were carried out during the two expeditions are mentioned.

D-50414

Capdevila, R., **Twenty-nine men from the North and one from Argentina** [Veintinueve hombres del norte y un argentino], *Buenos Aires. Instituto Antártico Argentino. Publicación*, 1993, No.24, 45p., In Spanish.

Highlights with commentaries are presented from each of the 12 chapters of a book written in 1904 by an Argentine Navy man, J.M. Sobral, who participated in the rescue of members of Dr. Otto Nordenskjöld's Swedish Antarctic Expedition after the sinking of their ship *Antarctic* in 1903.

D-51309

Lemke, P., ed, **Expedition ANTARKTIS X/4 of RV *Polarstern* in 1992**, *Berichte zur Polarforschung*, 1994, No.140, 90p., With German summary of cruise weather.

Following a resumé of the weather conditions experienced throughout the cruise, an account is given of the research activities undertaken at sea. These include sea water chemistry; marine meteorology from radiosonde and AWS instrumentation; remote sensing of sea ice conditions; marine biology; plankton in and under sea ice; bird and seal observations; lipid investigations of copepods; and sediment sampling. The report closes with a station list showing the station number, date, start position, work depth, and type of work; a listing of participating institutions, cruise participants, and ship's crew.

See also:

B-50289 E-51578 G-49500 J-50413 L-49857

E. GEOLOGICAL SCIENCES

E-49498

Nakamura, N., et al, **Determination of picogram quantities of rare-earth elements in meteoritic materials by direct-loading thermal ionization mass spectrometry**, *Analytical chemistry*, 1989, 61(7), p.755-762, 25 refs.

A procedure for direct-loading isotope dilution mass spectrometry (DL-IDMS) of rare-earth elements (REE), alkaline-earth metals (Mg, Ca, Sr, and Ba), alkali metals (K and Rb), and iron in microcomponents of meteorites (including ALH-765) is described. Without chemical separation the acid-decomposed sample was directly loaded onto a mass spectrometer filament and subjected to thermal ionization mass spectrometry with careful control of the filament current and the oxygen partial pressure. This technique permits precise concentration determinations of individual REE in meteoritic and terrestrial materials such as chondrules, mineral fragments, and basaltic samples. The results demonstrate the presence of highly fractionated REE in microcomponents of meteorites, which indicates a new chemical aspect of REE in the early planetary materials. The DL-IDMS technique can thus be used as the only means of high-precision analyses of small planetary materials with low REE contents. (Auth.)

E-49506

Lin, Y.T., et al, **Inspiration from study of antarctic meteorites (II)—Discovery of the first EL3 chondrite**, *Chinese science bulletin*, Aug. 1993, 38(15), p.1277-1279, 8 refs.

Chondrites can be classified into different types from 1 to 6 with increasing degree of thermometamorphism. EH-chondrites fall between types 3 and 5 with lack of type 6, while all of the 17 EL chondrites were reported to be of type 6. Such distribution of the chemical-petrographic types of enstatite chondrites was used as a key argument that these two chondrites came from a single parent body. Reckling Peak A80259 was reported as the first EL5 chondrite; however, solid solution of FeS-MgS-MnS system in this chondrite exists as niningerite, a distinctive phase of EH chondrites. In addition, the Kaidun IV meteorite contains EL3-like material but has a clast enclosed. MAC88136 was collected in MacAlpine Hills by the American Polar Exploration Team in 1988. The sample is fresh and weighs 74.4 g. It was tentatively classified as an E3 enstatite chondrite. In this report the petrographic and mineralogical features of MAC88136 are described and evidence is supplied for the first EL3 enstatite chondrite classification. Furthermore, MAC88136 chondrite is compared with EH3 and EL6 chondrites to reveal the differences between EH and EL parent bodies and the influence of thermometamorphism on the parent body of EL chondrites. (Auth.)

E-49511

Gow, C., **Enigmatic new reptile from the Lower Triassic Fremouw Formation of Antarctica**, *Palaeontologia africana*, 1992, Vol.29, p.21-23, 4 refs.

The partial skull of a new reptile from the Lower Triassic of Antarctica is described. It has a distinctive *procolophon*-like dentition, but other features suggest it is a diapsid. The name *Fremouwsaurus geludens* is proposed for the new animal. It is not possible to place the new form in any known higher taxon, so it is necessary to establish a new Family Fremouwsauridae to receive it. (Auth.)

E-49512

Wright, I.P., et al, **Xylan: a potential contaminant for lunar samples and antarctic meteorites**, Lunar and Planetary Science Conference, 22nd, Houston, TX, 1991. Proceedings. Edited by G. Ryder and V.L. Sharpton, Houston, TX, Lunar and Planetary Institute, 1992, p.449-458, 16 refs.

DLC QB592.A64a 1992

A proprietary paint known as Xylan has been used to coat screw threads in the dry-N sample processing cabinets at the Johnson Space Center (JSC). Xylan that is either prepared or applied incorrectly does not adhere well to the threads and can become dislodged. This lubricant therefore has to be considered a potential contaminant for lunar samples and antarctic meteorites that have been processed at JSC. Since Xylan is not fully removed during stepped combustion until temperatures in excess of 600°C are attained, interpretation of data obtained from lunar samples and meteorites at temperatures less than 600°C should be treated with some caution. In spite of this, it is argued that the unexpectedly high concentration of organic material found in EET A79001 is not due to Xylan contamination, nor is it considered likely that previous C and N analyses of lunar samples have been affected by the introduction of Xylan. (Auth. mod.)

E-49525

Buatois, L.A., Medina, F.J., **Stratigraphy and depositional setting of the Lagrelus Point Formation from the Lower Cretaceous of James Ross Island, Antarctica**, *Antarctic science*, Dec. 1993, 5(4), p.379-388, Refs. p.387-388.

The Lagrelus Point Formation is the basal unit of the Gustav Group and crops out on the northwest coast of James Ross I. It consists of about 250 m of coarse-grained siliciclastic rocks. The type section of the Lagrelus Point Formation is defined here from just south of Lagrelus Point. The measured section comprises the uppermost 80 m of the unit and mainly consists of clast-supported, boulder, cobble to pebble conglomerates; very coarse to medium-grained sandstones occur rarely. Four sedimentary facies are recognized: a disorganized conglomerate facies, interpreted as having been deposited from non-cohesive debris flows and high density gravelly turbidity currents; inversely graded conglomerate facies, and normally graded to graded stratified conglomerate and pebbly sandstone facies reflecting sedimentation from high density gravelly turbidity currents; and massive and parallel stratified sandstone facies, recording deposition from high density sandy turbidity currents. Two types of facies assemblages have been recognized: a major channel assemblage, represented by the lower part of the measured section, and the minor channel assemblage forming the upper part of the section. The total succession is thought to represent the aggradation of a major submarine braided channel followed by the establishment and subsequent infill of a series of minor channels in a marginal terrace. (Auth.)

E-49526

Harley, S.L., **Sapphirine granulites from the Vestfold Hills, East Antarctica: geochemical and metamorphic evolution**, *Antarctic science*, Dec. 1993, 5(4), p.389-402, 28 refs.

A varied suite of sapphirine-bearing and quartz-undersaturated granulites, the Taynaya Paragneiss, occur as boudins and enclaves within the c. 2500 Ma old felsic orthogneisses of northern Vestfold Hills. Highly magnesian varieties with X(Mg) (=100x(Mg/(Mg+Fe))) near 95 preserve the assemblage sapphirine+enstatite+spinel, whereas sapphirine+cordierite+sillimanite+corundum occurs in aluminous and feldspathic types with X(Mg) near 90. Phase equilibria and relative thermometry based on Al₂O₃ solubility in enstatite indicate equilibration of these assemblages at c. 830-880 °C and 0.35-0.85 GPa. Two types of metasomatism have altered the bulk rock compositions near boudin and enclave margins. Cordierite rinds locally formed on corundum-sillimanite granulites reflect interaction with magmatic precursors to the enclosing felsic gneisses, as supported by the isotopic and chemical compositions of cordierite channel volatiles. More extensive metasomatism-producing schistose phlogopite+sapphirine rinds on all boudins involved infiltration of a LILE-enriched fluid which introduced K₂O, H₂O, Fe, Rb, Ba and minor Sr along the boudin margins. Whole rock geochemistry of Taynaya Paragneiss unaffected by this metasomatism is consistent with their derivation from evaporitic mudstones, and implies the existence of a basement older than the dominant 2500 Ma orthogneisses. (Auth. mod.)

E-49528

Webb, J.A., Fielding, C.R., **Revised stratigraphical nomenclature for the Permo-Triassic Flagstone Bench Formation, northern Prince Charles Mountains, East Antarctica**, *Antarctic science*, Dec. 1993, 5(4), p.409-410, 9 refs.

The East Antarctic Craton contains only one substantial outcrop of Palaeozoic-Mesozoic strata between 0 and 150E; this lies in Mac. Robertson Land, on the eastern margin of the northern Prince Charles Mountains. These rocks are known as the Amery Group and comprise dominantly fluvial sandstones, with subordinate shales, coals and conglomerates. The uppermost formation within the Amery Group, the Flagstone Bench Formation, was studied in detail by Webb and Fielding (1993), who revised the stratigraphy and defined a new member, the Jetty Member. They described for the first time a Triassic megaf flora from this unit, considerably extending the time range for the Amery Group, which was previously regarded as entirely mid-to Late Permian in age. (Auth.)

E-49573

Elliot, D.H., **Jurassic magmatism and tectonism associated with Gondwanaland break-up: an antarctic perspective**, *Geological Society of America. Special paper*, 1992, No.68, Magmatism and the causes of continental break-up. Edited by B.C. Storey, T. Alabaster and R.J. Pankhurst, p.165-184, Refs. p.178-184.

Magmatic and tectonic activity in Antarctica associated with the early stages of continental rifting and break-up of Gondwana culminated with tholeiitic magmatism at about 175- 180 Ma. In the Ross Sea sector of the Transantarctic Mountains, Jurassic igneous rocks, comprising pyroclastic rocks and Ferrar Group tholeiitic basalts, overlie fluvial strata of the Permian-Upper Triassic Gondwana sequence. Petrological, structural and volcanological data suggest that the Jurassic pyroclastic rocks and overlying flood basalts were erupted into a volcano-tectonic rift system associated with lithospheric extension and decompression melting. Geochemically the Ferrar tholeiites form part of the Gondwana low-Ti province, but they exhibit marked differences in initial ⁸⁷Sr/⁸⁶Sr ratios and in high field strength element abundances in comparison with other parts of the province. Three Early to Middle Jurassic tectono-magmatic terrains were present in this part of Gondwana: a plate margin magmatic arc; a belt of silicic within-plate igneous rocks inboard of the arc; and a continental flood basalt province (the Gondwana low-Ti province). (Auth. mod.)

E-49586

Yu, S.H., et al, **Characteristics of the REE in Yanwo Lake core at Great Wall Station, Antarctica**, *Antarctic research (Chinese edition)*, 1993, 5(3), p.48-54, In Chinese with English summary. 5 refs.

The rare earth element (REE) concentration and distribution were studied in sediments obtained from a 7.7 m deep hole drilled in Yanwo Lake, 14.5 m above sea level, on King George I. The source of sediments is discussed. Analysis shows that the REE values ranged from 51.8 to 89.2 ppm, with an average of 70.2 ppm. A general tendency of REE to decrease from subclay with fine sand to fine sand with gravel was found. The REE distribution patterns are similar to those of the sediments from the Great Wall Bay, indicating that they have the same material source. Clear correlation between REE and Cr, Fe, Co, Hf, Sc, Mo, As, and Sb is seen; REE and Ca, Na, Rb, Ta, Zr, V, and Zn show various degrees of negative relation. (Auth. mod.)

E-49598

Wang, D.D., Lin, Y.T., **Inspiration from study of antarctic meteorites III: overview on antarctic lunar meteorites and their evolutionary history**, *Antarctic research (Chinese edition)*, 1993, 5(2), p.1-20, In Chinese with English summary. Refs. p.19-20.

Of 12 meteorites from the Moon collected and identified up to date, 11 were discovered in antarctic blue ice fields. It is suggested that the lunar meteorites probably came from the far side of the Moon, a K-, REE- and P-poor highland region. Petrology, mineralogy, chemical composition, isotopic chronology and noble gases indicate that all of the lunar meteorites are a-chondritic and have been classified into anorthositic lunar meteorites, basaltic lunar meteorites and basaltic-

anorthositic lunar meteorites. These three kinds of lunar meteorites are identical to lunar highland anorthosite, mare basalt and their mixture, respectively. In spite of similarities in petrography and composition of major elements between the anorthositic lunar meteorite and the lunar highland anorthosite returned by Apollo and Luna spacecrafts from the surface of the Moon, contents of incompatible and rare earth elements are far lower in the former than the latter, i.e. the anorthositic lunar meteorite is K-, Ree- and P-poor (KREEP-poor). Compared with the basaltic lunar meteorites, the anorthositic lunar meteorites are rich in refractory siderophile elements with a chondritic ratio indicating contribution of chondrites. (Auth. mod.)

E-49603

Zhao, Y., et al, **Early Paleozoic event of low-pressure granulite facies metamorphism in the Larsemann Hills, East Antarctica: evidence from Sm-Nd isotopic chronology**, *Antarctic research (Chinese edition)*, 1993, 5(2), p.52-56, In Chinese with English summary. 9 refs.

Sm-Nd isotopic dates of a representative mafic granulite sample (G212-3,M_I) and a gneissic leucogranite sample (W20401,M_I) indicate that the low-pressure granulite facies metamorphism in the Larsemann Hills occurred in the Early Paleozoic ('Pan-African Event'). The former (G212-3), which consists of orthopyroxene-hornblende-plagioclase-whole rock, yields an internal isochron of 540 +/- 75 Ma; the latter (W20401), which is made up of garnet-K-feldspar-whole rock, gives an internal isochron of 497 +/- 7 Ma. Evidence from field geology shows that the low-pressure granulite facies metamorphism in the area was accompanied by extensive partial melting as well. (Auth.)

E-49610

Koh, Y.Y., Park, Y.A., Choe, M.Y., **Analysis of beach gravels in Barton and Weaver peninsulas, King George Island, Antarctica**, *Korean journal of polar research*, June 1993, 4(1), p.39-51, In Korean with English summary. Refs. p.50-51.

During the 1991 Korean antarctic summer expedition, coastal investigations were conducted on Barton and Weaver peninsulas, with emphasis on the morphology of beach surfaces and composition of beach deposits. The latter were found to consist of well rounded gravels divided into 3 different elevation series. The lower series includes elevations of 2.4, 3.3, 3.4, 4.0, 5.9 and 6.3 m above sea level on Barton Peninsula, and 4.0, 4.4 and 6.3 m on Weaver Peninsula. The reworked gravels are widespread, transported by ice from the raised old beach to levels of 30, 35 and 50 m. The upper series reaches up to 75, 85-90, 105-120 and 125 m on Barton Peninsula, and 80 m on Weaver Peninsula. The coarsening upward sequence found on the northeastern coast of King Sejong Station indicates a relative fall in sea level. The mean size (43.7mm) and roundness (0.63) of the upper series gravels are greater than in the lower series. (Auth. mod.)

E-49619

Clarke, G.L., Norman, A.R., **Generation of pseudotachylite under granulite facies conditions, and its preservation during cooling**, *Journal of metamorphic geology*, May 1993, 11(3), p.319-335, Refs. p.334-335.

Discontinuous ultramylonite zones cut Proterozoic granulite facies gneisses in Mac. Robertson Land and preserve evidence of ductile non-coaxial flow and reverse sense of shear. Cross-cutting relationships indicate that ultramylonite deformation involved overthrusting to the east, but progressively rotated to involve overthrusting to the north; rotation of the principal compressive stress axes is inferred. Extensive pseudotachylite developed during ultramylonitization, the history of individual ultramylonite zones having involved a single episode of pseudotachylite generation. Neoblastic sillimanite indicates that ultramylonitization occurred at >520 C. Most of the pseudotachylite veins are undeformed; the mechanism(s) of fracturing and melting must have caused strain hardening in rocks surrounding the ultramylonite, further strain having been mostly accommodated by a new or subsidiary shear zone. Renewed stress at reduced strain rates, or renewed stress in zones in which the proportion of pseudotachylite was significantly higher, could have led to the rare occurrences of deformed pseudotachylite. The preservation of fine-grained pseudotachylite is dependent on its remaining dry. (Auth. mod.)

E-49631

Hall, K.J., **Wind-blown particles as weathering agents? An antarctic example**, *Geomorphology*, Oct. 1989, 2(4), p.405-410, 27 refs.

Observations from Taylor Valley suggest that the wedging effect of sand particles, packed by powerful winds into cracks in rocks, may act as a weathering mechanism. The strong winds and their accompanying solid material may cause stresses to the rock in three ways: the direct pressure of the wind and material, the hammering effect of the particles, and by preventing the closure of cracks opened by other forces. Although crude estimations of the forces involved have been calculated, actual field measurements are needed. This is a process which may operate in other dry environments on this planet and possibly on some of the hyper-dry inner planets of the solar system. (Auth.)

E-49639

De Batist, M., et al, **High-resolution seismic investigation of the evolution (stratigraphy and structures) of the continental margins of the eastern Weddell Sea and of the Antarctic Peninsula**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.2, Brussels, Belgian Science Policy Office, 1993, 70p., Refs. p.67-70.

During the ANTARKTIS VII/5 cruise (Dec. 1989-Mar. 1990), the seismic grid already available in the Weddell Sea could be expanded with up to 4100 km of high-resolution reflection seismic profiles. The Meso-Cenozoic seismostratigraphic model originally defined on ODP Site 693 (Leg 113) was extended throughout the existing seismic database along the entire eastern Weddell Sea continental margin. The high-resolution seismic database in the southeastern Weddell Sea yields new insights in the detailed and fine-scale sequence stratigraphic structure and buildup of the entire Crary Fan depositional system, from the proximal parts on the continental slope to the more distal parts in the Polarstern Bank area. Sedimentary processes, such as channel-levee deposition and depocenter migration, are discussed, as well as the fan system's development through time and as a response to eustatic sea-level fluctuations. Based on a good-quality seismic profile connecting the shelf deposits (off Halley Bay) with the fan area, a climatic-eustatic controlled sedimentation model is advanced, explaining the development of the entire southeastern Weddell Sea continental margin since mid-Oligocene times. Further interpretation has also been made of the seismic data of the northwestern Antarctic Peninsula, which cover the rift basin of Bransfield Strait, an elongated sediment-filled trough interpreted as a fore-arc basin, accretional and progradational slopes, recent and ancient trench environments and the facing oceanic domain. (Auth. mod.)

E-49655

Doubleday, P.A., Macdonald, D.I.M., Nell, P.A.R., **Sedimentology and structure of the trench-slope to forearc basin transition in the Mesozoic of Alexander Island, Antarctica**, *Geological magazine*, Nov. 1993, 130(6), p.737-754, 45 refs.

The Mesozoic forearc of Alexander I. is one of the few places in the world where the original stratigraphic relationship between a forearc basin and an accretionary complex is exposed. Newly discovered sedimentary rocks exposed at the western edge of the forearc basin fill record the events associated with the basin formation. These strata are assigned to the newly defined Selene Nunatak Formation and Atoll Nunataks Formation within the Fossil Bluff Group. The Selene Nunatak Formation contains variable thicknesses of conglomerates and sandstones, predominantly derived from the LeMay Group accretionary complex upon which it is unconformable. The formation marks emergence and subsequent erosion of the inner forearc area. It is conformably overlain by the 1 km thick Atoll Nunataks Formation, characterized by thinly-bedded mudstones and silty mudstones representing a marine transgression followed by trench-slope deposition. The Atoll Nunataks Formation marks a phase of subsidence, possibly in response to tectonic events in the accretionary prism, which occurred at about the same time. The Atoll Nunataks Formation is conformably overlain by the Himalia Ridge Formation, a thick sequence of basin-wide arc-derived conglomerates. This transition from fine- to coarse-grained deposition suggests that a well-developed depositional trough had formed by that time. The Atoll Nuna-

taks Formation therefore spans the formation of the forearc basin, and marks the transition from trench-slope to forearc basin deposition. (Auth. mod.)

E-49658

Macdonald, D.I.M., Moncrieff, A.C.M., Butterworth, P.J., **Giant slide deposits from a Mesozoic fore-arc basin, Alexander Island, Antarctica**, *Geology*, Nov. 1993, 21(11), p.1047-1050, 16 refs.

Several very large synsedimentary slide units exist in the well-exposed Mesozoic fore-arc sequence of Alexander I. The largest single exposure, which is at least 440 m thick and more than 21 by 6 km in area, forms part of a unit that has a volume of as much as 300 km³. These units are as large as slide deposits noted by remote sensing on modern continental margins. The apparent absence of large, ancient slide deposits is therefore purely a function of exposure. The enormous size of these antarctic examples, in which sheets of partially lithified sediment up to 1 km long have been transported with little or no internal deformation or tilting, emphasizes the care needed in determining that even very large outcrops are not allochthonous. (Auth.)

E-49664

Boucher, L.D., Taylor, E.L., Taylor, T.N., ***Dicroidium* from the Triassic of Antarctica**, *New Mexico Museum of Natural History and Science. Bulletin*, 1993, No.3, Nonmarine Triassic, edited by S.G. Lucas and M. Morales, p.39-46, 29 refs.

Late Triassic *Dicroidium* seed fern foliage is described from compressions and impressions collected at Mt. Falla in the Beardmore Glacier region (Falla Formation). Associated floral components include fern and gymnosperm foliage, and several reproductive structures. Morphological and cuticular features among more than 200 *Dicroidium* specimens were compared in order to delimit species. These include: *D. odontopteroides*, *D. lancifolium* and *D. dubium*. Fronds are pinnate, and many of the specimens illustrate the dichotomously forking rachis. Pinule shapes vary from ovate to lanceolate and are lobed in one species. Venation patterns include taeniopteroid, odontopteroid, and alethopteroid. Cuticular features are well-preserved in some specimens and show epidermal cell arrangements, surface ornamentation, and stomatal and trichome base arrangement. This is the first description of *Dicroidium* cuticle from antarctic compressions. The geographic and stratigraphic distribution of *Dicroidium* species from the Triassic of Antarctica is summarized. (Auth.)

E-49666

Blume, H.P., Bölter, M., **Soils of Casey Station (Wilkes Land, Antarctica)**, Joint Russian-American Seminar on Cryopedology and Global Change, Pushchino, Nov.15-16, 1992. Post-seminar proceedings. Edited by D.A. Gilichinskii, Pushchino, Pushchino Research Centre, 1993, p.96-104, 20 refs.

A research program at Casey Station, Wilkes Land, emphasizing pedological features of the soils of this region, was run in cooperation with other ecological investigations. These investigations were conducted in order to correlate soil properties with plant cover, ecophysiological, microbiological and chemical descriptions to a comprehensive study of this area. Strong correlations were observed between the soils and vegetation cover. Podzols were covered by stone and soil lichens together with mosses in all cases. No soil lichens and only a few stone lichens were observed on silty leptosols and regosols, and especially on loamy leptosols. (Auth. mod.)

E-49667

Bockheim, J.G., **Global change and soil formation in the Antarctic region**, Joint Russian-American Seminar on Cryopedology and Global Change, Pushchino, Nov.15-16, 1992. Post-seminar proceedings. Edited by D.A. Gilichinskii, Pushchino, Pushchino Research Centre, 1993, p.132-140, 18 refs.

The distribution of soils in the Southern Circumpolar Region is dependent on bioclimatic gradients. Whereas the processes of podzolization, rubification, and organic matter accumulation decline in relative magnitude southward, the processes of salinization and desert pavement formation increase in relative importance along the bioclimatic gradient. The potential impacts of global warming on soils in the

Southern Circumpolar Region will be dependent on the behavior of the West Antarctic ice sheet, which has collapsed during major interglaciations. In the worst-case scenario, projected increases in temperature of 6 to 8 °C in the mid-southern latitudes could initiate disintegration of the West Antarctic ice sheet. This would increase global sea level by 5 to 6 m, causing flooding of coastal areas and expansion of alpine glaciers in the Transantarctic Mountains. This in turn would reduce the total ice-free area of the continent. Collapse of the West Antarctic ice sheet would cause a poleward shift in the Antarctic Convergence and in bioclimatic zones. These shifts would cause changes in soil-forming processes, the magnitude of which would be dependent on their rate of adjustment to an increase in temperature. Moderate changes in soil-forming processes could occur in the Subantarctic Tundra and Polar Desert Zones. However, minimal changes would occur in the Cold Desert Zone, except possibly in ice-free areas along the coast. Based on soil chronosequence studies, an ultraxerous climatic regime probably has persisted in the Transantarctic Mountains for the past 2.2 million years. In contrast to this worst-case scenario, global warming in the southern latitudes may be accompanied by increased precipitation, causing expansion of the antarctic ice sheet as is occurring at the present time. (Auth. mod.)

E-49668

Bockheim, J.G., Bölder, M., Campbell, I.B., **Design of an experiment to detect the effects of global change on soil development in the Southern Circumpolar Region**, Joint Russian-American Seminar on Cryopedology and Global Change, Pushchino, Nov.15-16, 1992. Post-seminar proceedings. Edited by D.A. Gilichinski, Pushchino, Pushchino Research Centre, 1993, p.146-164, Refs. p.161-164.

A long-term experiment is proposed for detecting response of terrestrial ecosystems to global warming and other human activities in the Southern Circumpolar Region. Benchmark ecosystems would be established in eight bioclimatic regions. Monitoring would include climatological, biological, and pedological measurements. Biological measurements would be restricted to monitoring biomass of important activities. The data would be integrated using appropriate computer programs. Rigorous quality assurance/quality controls would follow standards set up by the U.S. Environmental Protection Agency. An environmental impact assessment would be made, together with effective monitoring procedures. The data would be archived for scientists working in the Southern Circumpolar Region. The proposed study would be designed similarly to the International Biological Program and would be under the auspices of the International Geosphere-Biosphere Program. The proposed work would be coordinated with similar work being proposed for the arctic region. (Auth.)

E-49670

Davey, M.C., **Carbon and nitrogen dynamics in a maritime antarctic stream**, *Freshwater biology*, Oct. 1993, 30(2), p.319-330, 27 refs.

The stream and the algal communities in a maritime antarctic lake outflow stream can be split into two zones: a semi-aquatic margin consisting of a perennial cyanobacteria/diatom mat and a flowing channel with a similar perennial mat that was overgrown by annual filamentous chlorophytes during the course of the summer. Neither algal community was limited by nutrient availability. Major nutrients were always available in the stream water. There were slight differences in the atomic ratios of the mats. There was no net carbon or nitrogen accumulation by the marginal mat, suggesting that uptake processes were balanced by loss processes. Maximum rates of carbon fixation were similar to those of other perennial antarctic algal mats. Productivity appeared to be limited by physical factors. There were no heterocystous cyanobacteria in the mat communities and rates of atmospheric nitrogen fixation were very low. Fixation accounted for only 0.3% of the nitrogen accumulation of the channel mats, but was higher in the marginal mat. Nitrogen accumulation by the channel mat averaged $0.34\text{gNm}^{-2}\text{day}^{-1}$. Only $0.05\text{gNm}^{-2}\text{day}^{-1}$ was accounted for by the uptake of dissolved inorganic nitrogen. The major (80%) source of nitrogen appeared to be dissolved organic nitrogen. (Auth. mod.)

E-49671

Rees, P.M., **Dipterid ferns from the Mesozoic of Antarctica and New Zealand and their stratigraphical significance**,

Paleontology, Sep. 1993, 36(3), p.637-656, 55 refs.

Two genera of dipteridaceous ferns, *Goeppertella* and *Hausmannia*, are described for the first time from the Mesozoic Hope Bay and Botany Bay assemblages of the northern Antarctic Peninsula, and *Goeppertella* from the Clent Hills assemblage of New Zealand. These are the first gondwanan records outside Argentina of *Goeppertella*. Two new species of the genus, *G. jeffersonii* and *G. woodii*, are described from Hope Bay and Botany Bay. Based on the global distribution of *Goeppertella*, its occurrence in these gondwanan floras indicates that they should be assigned an Early Jurassic or possibly earlier age, contrasting sharply with recently published Late Jurassic or Early Cretaceous age assignments. A pre-Late Jurassic age for the Hope Bay and Botany Bay assemblages is further supported by independent evidence from radiometric data. An earliest Cretaceous age for these assemblages has been adopted in most recent interpretations of volcanic arc evolution and palaeogeography in this region of Antarctica, the plant-bearing beds providing direct evidence of terrestrial sedimentation: these interpretations are revised here, based upon the new evidence. The ages assigned to a number of other late Mesozoic gondwanan floras, particularly from Argentina and India, must be reconsidered since many of these were dated on the basis of comparison with the Hope Bay assemblage. (Auth.)

E-49680

Barrett, P.J., Harwood, D.M., **Geological background and rationale for drilling**, Antarctic Stratigraphic Drilling, Cape Roberts Project, Workshop report. Royal Society of New Zealand, Misc. Ser. No.23, Wellington, New Zealand, 1992, p.4-10.

Scientific drilling has shown that the antarctic continental shelf was blanketed with glacial sediments in many places more than 2 km thick and extending back at least 40 million years. These sediments are now widely recognized to be the product of advance and retreat of continental ice sheets, with their attendant influence on sea level change. The detail of that history is derived from seismic stratigraphy and locally documented from drillhole data. Further drilling is now proposed, with both tectonic and paleoenvironmental objectives, to core strata that lie beneath the blanket of Oligocene and younger glacial sediment in the Ross Embayment. Specific problems to be addressed during the drilling include global ice volume and sea level changes; regional tectonics; rift margin processes; evolution of high-latitude biota; antarctic paleoecology; paleontological dating; and useful microfossil groups. (Auth. mod.)

E-49681

Cooper, A.K., **Selection of sites from geophysical surveys**, Antarctic Stratigraphic Drilling, Cape Roberts Project, Workshop report. Royal Society of New Zealand, Misc. Ser. No.23, Wellington, New Zealand, 1992, p.11-14.

A review of available multichannel and single channel seismic data has allowed the selection of three east-west lines showing the seismic sequences of interest. Four drill sites are located on each line, which if taken to 500 m sub-sea floor would core a 1500 m section from seismic unit V3 through seismic unit V4 and into seismic unit V5. The northernmost (multichannel) line is the preferred option, especially for drilling V4 and V5. (Auth.)

E-49687

Fitzsimons, S.J., **Supraglacial eskers in Antarctica**, *Geomorphology*, Oct. 1991, 4(3-4), p.293-299, 9 refs.

This paper describes eskers that form at the edge of the ice sheet in the Vestfold Hills. Eskers are linear ridges that are deposited by streams constrained by glacier ice. Their formation requires a sediment source and the presence of meltwater capable of thermal erosion and penetration of glacier ice. These requirements mean that eskers are generally associated with temperate glaciers and not usually with cold, polar glaciers. The eskers described in this paper form small ridges of gravel adjacent to ice-cored moraines. The form, orientation and sedimentary properties together with consideration of the field relationships suggest they were formed by supraglacial streams that drain moraine-dammed lakes and recycle sediment deposited on ice-cored moraines. The small size of the eskers combined with the active nature of ice marginal processes in the area means the eskers have a low preservation potential and do not occur beyond the ice margin in the Vestfold Hills. (Auth.)

E-49705

Lanyon, R., Black, L.P., Seitz, H.M., **U-Pb zircon dating of mafic dykes and its application to the Proterozoic geological history of the Vestfold Hills, East Antarctica**, *Contributions to mineralogy and petrology*, Nov. 1993, 115(2), p.184-203, 47 refs.

The Vestfold Hills, one of several Archaean cratonic blocks within the East Antarctic Shield, comprises a high-grade metamorphic basement complex intruded by at least nine generations of Early to Middle Proterozoic mafic dykes. Extensive U-Pb ion microprobe (SHRIMP) analyses of zircons, derived predominantly from late-stage felsic differentiates of the mafic dykes, provide precise crystallization ages for several dyke generations. These new ages enable constraints to be placed on both the history of mafic magmatism in the Vestfold Hills and the timing of the various interspersed Proterozoic deformation events. In addition to demonstrating the utility of zircons derived from felsic late-stage differentiates for the dating of co-genetic mafic dykes, this study also places doubt on previous whole-rock Rb-Sr dating of mafic dyke suites in this and other areas of East Antarctica. Details of this phase of the study are set forth, explained, and discussed for the range of about 1230 Ma to about 2740 Ma. (Auth. mod.)

E-49710

Montanari, A., Asaro, F., Michel, H. V., Kennett, J.P., **Iridium anomalies of Late Eocene age at Massignano (Italy) and ODP site 689B (Maud Rise, Antarctic)**, *Palaios*, Oct. 1993, 8(5), p.420-437, 70 refs.

Iridium anomalies of Late Eocene age are reported from sequences in northern Italy and the Weddell Sea. 270 samples of marly limestone from the Eocene/Oligocene boundary section at Massignano, Italy were analyzed. 410 samples of Late Eocene age from ODP 689B at Maud Rise in the Weddell Sea were also analyzed. They reveal a distinct peak of Ir at 156 ppt occurring in sediments of normal remanent magnetization having an age of about 35 Ma. The principal Ir anomaly in ODP 689B seems to be about 0.2 to 0.5 Ma younger than that of the Italian samples. Differences and similarities in the samples from each site are examined. (Auth. mod.)

E-49719

Walcott, C.R., Craw, D., **Subsolidus physical and chemical mixing of granite and gabbro during mylonitization, South Victoria Land, Antarctica**, *Journal of structural geology*, Dec. 1993, 15(12), p.1433-1441, 25 refs.

At Dromedary Massif, Southern Victoria Land, a suite of coarse-grained granite dykes cross-cuts a gabbro pluton which has been partially metamorphosed at amphibolite facies. During regional deformation, strain has been inhomogeneously distributed through the gabbro pluton and has been concentrated in granite dykes. In zones of relatively high strain, the granite dykes have developed a mylonitic fabric. A high strain gradient between granitic mylonite and metagabbroic host rock has induced isochemical mylonitization of the margin of the host. This grain size reduction allowed chemical diffusion between granitic and metagabbroic mylonites, resulting in a marginal zone of biotite-rich mylonite with intermediate composition. Biotite-rich mylonite decoupled from metagabbroic mylonite and flowed with granitic mylonite. Continued folding and transposition of granitic mylonite and biotite-rich mylonite has produced compositionally banded mylonite zones through thorough and irreversible mixing of the two lithologies. (Auth.)

E-49725

Lawver, L.A., Dalziel, I.W.D., Sandwell, D.T., **Antarctic plate: tectonics from a gravity anomaly and infrared satellite image**, *GSA today*, May 1993, 3(5), p.117-119, 122, 32 refs.

Two separate sets of satellite geophysical data pertaining to the structure and development of the antarctic plate have recently become available. Altimeter profiles of sea-surface topography yield gravity anomalies over the entire southern ocean, and the major features of the sub-ice structure of the continent can be discerned in radiometer images. Digital combination of the two data sets has generated a composite gravity anomaly-infrared satellite image of the Earth south of 60S

as viewed from above the pole. The combined image is particularly valuable for study of the relation between the tectonic development of the continental and oceanic lithosphere. (Auth.)

E-49728

Fukuda, M., Sone, T., Orihara, H., **Report on permafrost study at Isla Marambio (Seymour Island)**, *Polar news*, Mar. 1993, No.56, p.10-14, In Japanese.

Borehole sampling of the permafrost on Seymour I. in the vicinity of the Argentine Marambio Station is described. A layer of ice was found at a depth of 2.3 m, and frozen Tertiary mudstone was found at a depth of 10 m.

E-49730

Nakao, S., **Recent topics in geological survey of the antarctic ocean**, *Polar news*, Mar. 1993, No.56, p.42-48, In Japanese.

Marine geological survey cruises by the oceanographic research vessel *Hakurei Maru* in the southern ocean, 1980-1990, are summarized. The 1989 cruise, Dec. 1989-Jan. 1990, traveled from Fremantle, Australia to the Amery Ice Shelf at about 73E and 67.5S, and conducted seismic surveys of the submarine topography of the Amery Basin. The previous cruise to the Amery Ice Shelf in 1984 was only able to reach about 74E and 69.2S, indicating that the Amery Ice Shelf had retreated about 110 km south. The 1990 cruise conducted seismic surveys of the submarine topography of the ocean floor between about 125 and 140E (Porpoise Bay and Dumont d'Urville Station along the coast), and between about 60 and 66S seaward. The seismic surveys indicated a seamount about 1000 m high adjoining a small trough over 4000 m deep off Dumont d'Urville Station; the largest feature was a submarine valley about 150 km long running east and west off Porpoise Bay.

E-49743

Kaminuma, K., **Dinosaurs lived in Antarctica**, *Polar news*, Aug. 1992, No.55, p.69-70, In Japanese.

The first tetrapod fossils discovered in Antarctica in 1967, those of *Lystrosaurus* from the Triassic about 220 m.y.a., indicated the presence of dinosaur ancestors. The first fossils of a true dinosaur, those of an ankylosaurus from the Late Cretaceous 96-65 m.y.a., were discovered by an Argentine team in 1986 on James Ross I. The second discovery by a British team on Vega I., also in the James Ross I. area, consisted of a partial skull, upper and lower jaws, fore limbs, pelvis, and vertebrae, of a 5 m long herbivorous hypsilophodontid from the Early Cretaceous 143-96 m.y.a. The third discovery, in the summer of 1990-91 by an Italian-American team on Mount Kirkpatrick, consisted of skull, limb, tooth, and other bone fragments of a dinosaur, approximately 20 m long, and as yet not identified.

E-49760

Sarkar, A., Singbal, S.Y.S., Fondekari, S.P., **Pesticide residues in the sediments from the lakes of Schirmacher Oasis, Antarctica**, *Polar record*, Jan. 1994, 30(172), p.33-38, 20 refs.

Concentration levels of various organochlorine pesticides and their derivatives—namely, hexachlorocyclohexanes (HCH) and the DDT compounds pp¹-DDT, op¹-DDT, pp¹-DDE, op¹-DDE, pp¹-DDD, and op¹-DDD—were determined in the sediments from 8 different lakes of the Schirmacher Oasis near Dakshin Gangotri, during the 6th Indian scientific expedition to Antarctica, Dec. 1986 to Feb. 1987. Concentration levels of HCHs and t-DDT in sediments of these lakes were in the ranges of 37.7-155 pg/g and 512.9-1131 pg/g, respectively. Among the isomers of HCH, gamma-HCH was most prominent, followed by alpha-HCH, whereas in the case of metabolites of DDT and its isomers, pp¹-DDT was dominant over others. However, all the other compounds of the DDT family were present in considerable amounts in all the lakes. There was no significant change in the monthly variation of the concentration levels of HCHs and DDTs in the lakes. (Auth.)

E-49768

Watt, G.R., Harley, S.L., **Accessory phase controls on the geochemistry of crustal melts and restites produced during water-undersaturated partial melting**, *Contributions to mineralogy and petrology*, Sep. 1993, 114(4), p.550-566, 56 refs.

The profound geochemical consequences of accessory phase behavior during partial melting of high-grade metapelites are demonstrated with reference to two geochemically distinct crustal melts, produced by biotite dehydration melting reactions under granulite facies (kbar 860 C) conditions. These two leucogneiss suites from the Brattstrand Bluffs coastline have similar field relations, transport distances (10-100s of meters) and major element chemistry. Type 1 leucogneisses have low Zr, Th and LREE, positive Eu anomalies and Zr/Zr* and LREE(t)/LREE(t)* values less than 1.0 (i.e. less than required to saturate the melt). Mass balance constraints suggest that these melts have been extracted before equilibration with host melanosomes. The dry, peraluminous nature of vapor-undersaturated melts inhibits monazite and zircon solubility and results in concentration of these phases in the residue. Melts are consequently depleted in LREE and HREE. If temperatures are high enough (850-870 C) to permit relatively large degrees of partial melting, then the feldspar component of the source will be removed almost completely, giving melts with large positive Eu anomalies. Melts formed under vapor-present conditions are unlikely to show such extreme LREE and HREE depletion or positive Eu anomalies, even at high degrees of partial melting. Disequilibrium melting coupled with source entrainment could fortuitously produce REE and trace element signatures similar to those typical of S-type granites and usually ascribed to equilibrium melting conditions. (Auth. mod.)

E-49771

Barron, J.A., Mahood, A.D., **Exceptionally well-preserved early Oligocene diatoms from glacial sediments of Prydz Bay, East Antarctica**, *Micropaleontology*, 1993, 39(1), p.29-45, 45 refs.

An exceptionally well-preserved early Oligocene diatom assemblage is documented and illustrated from the internal sediment of a gastropod shell, which was collected from glacial sediments recovered at Ocean Drilling Program Site 739 on the continental shelf in Prydz Bay. The diatoms were deposited between 35.9 and 34.8 Ma according to diatom and calcareous nannofossil stratigraphy, apparently soon after a period of major ice sheet advance across the Prydz Bay continental shelf. The diatom assemblage is neritic in character, but it can readily be correlated with open ocean assemblages from the southern ocean as well as with similar material recovered from the CIROS-1 drillhole in the Ross Sea. (Auth.)

E-49773

Marks, K.M., Stock, J.M., **Variations in ridge morphology and depth-age relationships on the Pacific-Antarctic Ridge**, *Journal of geophysical research*, Jan. 10, 1994, 99(B1), p.531-541, 39 refs.

The spreading corridor southwest of Fracture Zone XII is characterized by a rift valley and an unusually small subsidence constant of 226 m/m.y., while the two spreading corridors immediately northeast of Fracture Zone XII have an axial high and a subsidence constant consistent with the global average. This abrupt variation in ridge morphology is not usually characteristic of medium-rate spreading centers, nor is such an abrupt variation expected of adjacent ridge segments that are spreading at the same rate. It is suggested that a thermal anomaly beneath the ridge may influence the first-order effects of spreading rate and lithospheric cooling enough to produce the observed rift valley and axial high and the different subsidence constants. Although there is no certainty as to what would produce the thermal anomaly here, it is speculated that when the spreading rate on the Pacific-Antarctic ridge increased from slow to intermediate rates since 20 Ma, so did the need for materials for accretion, which may be supplied in part by along-axis asthenospheric flow from hotspots or a hot region to the northeast. A sufficient supply of hot asthenosphere may still be lacking in the ridge segment with the axial valley to the southwest, leaving it cooler and starved for accretionary materials. (Auth. mod.)

E-49774

Dalziel, I.W.D., **Tectonic evolution of a forearc terrane, southern Scotia Ridge, Antarctica**, *Geological Society of America. Special paper*, 1984, GSA SP-200, 32p., 74 refs.

DLC QE601.D29 1984

Metamorphic and sedimentary rocks of the South Orkney and South Shetland island groups and the northern tip of the Antarctic Peninsula appear to represent the products of subduction-related accretion and of sedimentation respectively in a forearc environment along the Pacific margin of Antarctica. Some of the rocks are imprecisely dated, but stratigraphic, paleontologic and radiometric data indicate that the higher temperature part of the subduction complex was formed and all sedimentary strata deposited prior to the initiation of Gondwana breakup. The remainder of the subduction complex, comprising comparatively high P/T assemblages, may be of late Mesozoic or even Cenozoic age. Lithology indicates that the metamorphic rocks represent pelagic and volcanic material from the ocean floor tectonically interleaved with slices of oceanic lithosphere. The sedimentary strata consist of graywacke and shale of turbidite facies associated with rare mafic pillow lava containing prehnite and pumpellyite. Bedding and primary structures are ubiquitously recognizable, although the rocks are everywhere deformed by one major set of sub-isoclinal to tight asymmetric folds with associated axial planar slaty cleavage. (Auth. mod.)

E-49779

Loopmann, A., et al, **Bathymetry of some lakes of the antarctic oases Schirmacher and Untersee**, *Limnological studies in Queen Maud Land (East Antarctica)*. Edited by J. Martin, Tallinn, Valgus, 1988, p.6-14, 3 refs.

DLC QH84.2.L56

Maps for 7 of the Schirmacher Ponds and for 2 lakes of the Unter-See Oasis based on bathymetric measurements carried out in May and June of 1976 are discussed and presented. The shore outlines of the lakes were drawn on a 1:2500 scale, based on measurements across the lakes and a topographic survey carried out in Jan. 1984. Geomorphological features of the region investigated are reviewed.

E-49781

Kaup, E., et al, **Limnological investigations in the Untersee Oasis (Queen Maud Land, East Antarctica)**, *Limnological studies in Queen Maud Land (East Antarctica)*. Edited by J. Martin, Tallinn, Valgus, 1988, p.28-42, 19 refs.

DLC QH84.2.L56

Results of investigations carried out by SAE 14 and 26 (1970 and 1985) of the Ober-See and Unter-See lakes are discussed and presented on maps, tables and graphs, including data on bottom topography, water temperature and oxygen content, and ice and snow chemistry and thickness.

E-49793

Hammer, W.R., Hickerson, W.J., **Comments on the fossil vertebrates from the Falla Formation Jurassic, Beardmore Glacier region, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.1, 8 refs.

The first fossil vertebrates from the Falla Formation of the central Transantarctic Mountains were collected during the 1990- 1991 austral summer from Mt. Kirkpatrick in the Beardmore Glacier region. Over 60 bones were recovered from one small exposure of tuffaceous siltstone near the top of the formation, and 3 isolated bones were found within 30 m of the bone concentration at about the same stratigraphic level. The Mt. Kirkpatrick fossils represent the first Jurassic terrestrial vertebrate fauna known from the antarctic continent. The pterosaur and dinosaurs also represent the first members of the Order *Pterosauria* and the Order *Saurischia* from Antarctica. The previously reported Cretaceous dinosaurs from islands off the Antarctic Peninsula, a hypsilophodont and an ankylosaur, both belong to the dinosaurian Order *Ornithischia*.

E-49794

Taylor, E.L., Boucher, L.D., Taylor, T.N., **Dicroidium foliage from Mount Falla, central Transantarctic Mountains**, *Antarctic journal of the United States*, 1992, 27(5), p.2-3, 14 refs.

Dicroidium is a widespread foliage type found in Triassic rocks throughout Gondwana. Samples of *Dicroidium* were collected from the north side of the western ridge of Mount Falla, near the Beardmore Glacier in the central Transantarctic Mountains. The fossils occur as compressions 135 m above the base of the type section of the Falla Formation. These rocks are considered to be Late Triassic (Carnian-

Norian) based on palynomorph assemblages. In addition to the 3 species from Mount Falla *Dicroidium* has been described from other localities in Antarctica. The antarctic taxa are most similar to *Dicroidium* described from Australia; however, the Mount Falla material is noteworthy in that bipinnate frond types, such as *D. zuberi*, are not known.

E-49795

Jiang, X.H., Harwood, D.M., **Glimpse of Early Miocene antarctic forests: Palynomorphs from RISP diatomite, *Antarctic journal of the United States*, 1992, 27(5), p.3-6, 32 refs.**

A clearer view of mid-Cenozoic antarctic terrestrial vegetation is available through the recovery of rich palynofloras in lower Miocene diatomite clasts from RISP Site J/9 sediment cores from beneath the Ross Ice Shelf. The authors report on a palynomorph assemblage recovered from a lower Miocene diatomite that was deposited in the south central Ross Embayment at a time of minimal glaciation. They believe that most, if not all, of the pollen was delivered to the site of marine diatom deposition from temperate to cool temperate forests in the Transantarctic Mountains (200 km to the west), or from island blocks of West Antarctica. The palynofloras reported here and in Jiang and Harwood (1993) reflect a primary assemblage of pollen and spores produced during the early Miocene, at the time of diatomite deposition. This allows reconstruction of a clearer picture of the antarctic vegetation for the middle Tertiary (approximately 20 million years ago).

E-49796

Wilson, T.J., **Brittle fault arrays in the Royal Society Range, southern Victoria Land, *Antarctic journal of the United States*, 1992, 27(5), p.6-8, 10 refs.**

The most prominent transverse break in the Transantarctic Mountains occurs along the southern end of the Royal Society Range, where the mountain chain steps westward toward the Byrd Glacier. During Mesozoic-Cenozoic rifting, this transverse zone was the site of voluminous magmatism in the Jurassic, now represented by extensive outcrops of Ferrar dolerite around the Skelton Névé, and in the Cenozoic from about 30 m.y.a. to the present within the McMurdo Volcanic province. Systematic mapping of the distribution, geometry, and displacement patterns of brittle fault arrays within the Royal Society Range is being carried out in the present study in order to investigate the structural development of this major transverse step in the Transantarctic Mountains.

E-49797

Janosy, R.J., Wilson, T.J., **Structural investigations of Early Paleozoic mafic dike swarms in the Royal Society Range, southern Victoria Land, *Antarctic journal of the United States*, 1992, 27(5), p.9-10, 12 refs.**

The pre-Devonian basement complex of the Transantarctic Mountains in southern Victoria Land is dominated by the igneous rocks of the Granite Harbor Intrusive Complex. This study is the first attempt to determine the stress regime associated with the dike swarm in Victoria Land and to use it to model plate interactions along the early Paleozoic margin of East Antarctica during the Ross orogeny. Structural analysis of the early Paleozoic dike swarm was conducted during the 1991-1992 field season in the foothills of the Royal Society Range between the Ferrar and Koettlitz Glaciers. The dike swarms exhibit a prominent northeast trend throughout most of the study area. The orientation data exhibit distinct trend and dip variations within and between localities; field relations and laboratory analysis will determine if these distinct orientations represent multiple dike sets. The dike chronology and trend data will be used to reconstruct the paleostress history of this sector of the Ross orogen.

E-49798

Faure, G., Mensing, T.M., Johnson, K.S., **Composition of rock clasts in the Mt. Acherar moraine and the Lewis Cliff ice tongue, *Antarctic journal of the United States*, 1992, 27(5), p.11-12, 6 refs.**

The large moraine at Mt. Acherar consists of a series of ice-cored ridges that were deposited by the Law Glacier and by the Lewis Cliff ice tongue. This ice-marginal moraine is composed of rock debris released by the ablation of basal ice during the retreat of the east antarctic ice

sheet. The rock clasts in the Mt. Acherar moraine are samples of the bedrock along the flowline of the ice leading from the central divide to the mouth of the Law Glacier and thereby provide information about the geology of the ice-covered interior of East Antarctica. During the 1990-1991 field season a cross section of the moraine was sampled at 200 m intervals. The lithologic compositions of 3,237 clasts larger than 16 mm from 32 till samples have been determined. The results indicate that the moraine is composed of dolerite and basalt, sandstone, siltstone, shale (gray, red, and black), and limestone, along with minor amounts of conglomerate, hornfels, and lithified till. Granitic igneous rocks and high-grade metamorphic rocks from the Precambrian shield of East Antarctica are absent.

E-49799

Fitzgerald, P.G., Redfield, T.F., Reynolds, S.J., Stump, E., **Fission track studies in northern Victoria Land in the 1991-1992 field season, *Antarctic journal of the United States*, 1992, 27(5), p.12-14, 11 refs.**

A previous reconnaissance fission track study in northern Victoria Land (NVL) determined that uplift and denudation responsible for the formation of the Transantarctic Mountains (TAM) began about 55 m.y.a. The pattern of apatite ages with elevation over most of NVL is similar to individual vertical profiles collected in southern Victoria Land (SVL). Age profiles show a distinctive "break-in slope" about 50 to 55 m.y.a., with samples above the break-in slope defining a shallow gradient and those below the break defining a steep gradient. The 1991-1992 field season in NVL was designed to further the scope of the reconnaissance study. The authors targeted specific areas where a carefully planned sampling strategy could address three main tectonic problems as follows: the question of Cretaceous uplift and denudation; the linking of the area of extreme uplift in the southeastern part of NVL with the rest of NVL; and the pattern of post-Jurassic uplift in NVL.

E-49800

Grunov, A.M., **Paleomagnetic studies of Mesozoic rocks from the Antarctic Peninsula: implications for Weddell Sea opening, *Antarctic journal of the United States*, 1992, 27(5), p.14-18, 9 refs.**

West Antarctica's location with respect to East Antarctica after the Middle Jurassic breakup of the Gondwana supercontinent is important for an understanding of the opening history of the Weddell Sea. West Antarctica is composed of four major crustal blocks: the Antarctic Peninsula (AP), the Ellsworth-Whitmore Mountains (EWM), the Thurston I.-Eights Coast (TI), and Marie Byrd Land (MBL). This article describes new paleomagnetic data from the Antarctic Peninsula (combined with existing geologic and geophysical data) that help to constrain the motion of the AP block relative to East Antarctica and hence increase understanding of the beginning history of the Weddell Sea.

E-49801

Feldmann, R.M., **Early geologic history of *Lyreidus* in Antarctica, *Antarctic journal of the United States*, 1992, 27(5), p.19-20, 8 refs.**

The Cretaceous and Paleogene rocks of Seymour I. have yielded an exceptionally diverse flora and fauna of over 800 species. Among them, marine megainvertebrates comprise a widespread and diverse assemblage of continental shelf inhabitants, many of which document biological affinities with contemporary organisms in New Zealand and South America. Examination of fossils from the James Ross Basin area has confirmed similar distribution patterns within non-molluscan groups. This pattern is particularly well illustrated by the distribution of the crab genus *Lyreidus*. The recent recognition of a new species of the genus from Antarctica has reinforced this dispersal pattern and forms the basis for this paper. The first description of *Lyreidus* from Antarctica in 1989 represented the oldest occurrence of the genus in the fossil record and established Antarctica as lying within the region of origin of the genus. This species, *Lyreidus antarcticus*, was collected from numerous sites within the Eocene La Meseta Formation on Seymour I.

E-49802

Filkorn, H.F., Feldmann, R.M., **Fossil corals from Seymour Island, Antarctica, *Antarctic journal of the United States*, 1992,**

27(5), p.20-21, 7 refs.

In general, the Cretaceous and Paleogene coral faunas on Seymour I. are dominated by taxa that have living descendants. The occurrences of 5 genera are unique to the James Ross Basin, 4 genera of corals within this assemblage representing the first occurrence of those genera in the fossil record, and at least 8 species in 5 genera are ancestral to living forms that are inhabitants of lower latitude, deep-water assemblages. Thus, observations based upon corals from Seymour I. corroborate conclusions based on the study of arthropods, molluscs, and echinoderms, that the southern high latitudes served as a site of origin for some modern deep-water species.

E-49803

Keller, R.A., Strelin, J.A., **Alkalic basalts and ultramafic xenoliths on James Ross Island, Antarctic Peninsula, *Antarctic journal of the United States*, 1992, 27(5), p.22-23, 15 refs.**

The fieldwork component of this study included the sampling of the volcanic stratigraphy of James Ross I. undertaken during Jan. and Feb. 1992 at Massey Heights, and the collection of ultramafic xenoliths near Ekelof Point. The sheer cliffs of Massey Heights offer excellent opportunities for observation and sampling of the volcanic stratigraphy of this area of the island. Most of the volcanic rocks on the island are mildly alkalic basalts and palagonite breccias between 7 and 1.5 million years old. One facet of this study will be the determination of the chemical compositions of the lavas collected and comparison of them with other recent lavas of the Antarctic Peninsula to evaluate the range of chemical variations of the mantle.

E-49804

Lipschutz, M.E., **Meteorite studies: terrestrial and extraterrestrial applications, 1992, *Antarctic journal of the United States*, 1992, 27(5), p.25-26, 8 refs.**

An important aspect of meteorite studies is the glimpse that they give of their parent bodies' origins and evolutions, and of processes that led to formation of their parent materials from different parts of the nebula from which the solar system derives. It is becoming increasingly obvious that the 15,000 meteorite fragments recovered to date from Antarctica—representing an estimated 3800 +/- 1800 separate impact events—provide a different window of the earth's sampling of planetary materials than is provided by the 1,763 finds and 1,103 falls observed elsewhere on earth. Much of the research carried out by the author's group in 1992 involved radiochemical neutron activation analysis (RNAA) and atomic absorption spectroscopy to determine part-per-million to part-per-trillion levels of 12 to 15 trace elements in each sample studied.

E-49805

Harvey, R.P., Schutt, J.W., **Meteorite recovery and reconnaissance near Pecora Escarpment and surrounding regions, *Antarctic journal of the United States*, 1992, 27(5), p.26-28, 2 refs.**

During the 1982-1983 field season, reconnaissance parties for ANS-MET (the Antarctic Search for Meteorites) visited sites near the Pecora Escarpment and Thiel Mountains, and established that significant concentrations of meteorites were present at surrounding localities. Consequently, the goals of the 1991-1992 ANSMET field season were to systematically collect meteorites from these known stranding surfaces and to further explore the potential of surrounding areas. The field season yielded a total of 606 meteorites, including several unusual specimens. Among these were the large mafic specimen from Brazitis Nunatak, a second, smaller mafic specimen from the LaPaz icefields, several interesting brecciated meteorites (at least one of which may be lunar), a few pallasite fragments, and many others, listed in a table.

E-49806

Benoit, P.H., Sears, D.W.G., Sears, H., Roth, J., **Natural thermoluminescence of meteorites and implications for ice movement in the Elephant Moraine region, *Antarctic journal of the United States*, 1992, 27(5), p.28-30, 7 refs.**

Measurements of natural thermoluminescence (TL) levels of many antarctic meteorites were carried out on the ongoing analysis of the meteorite collection from the Elephant Moraine region. The authors

have measured the natural TL levels of more than 800 meteorites, including approximately 150 from the Elephant Moraine region. They report here on data for ordinary chondrites collected during the 1987-1988 field season; data for meteorites collected during the 1990-1991 field season are presently being processed. The Elephant Moraine region encompasses at least 5 meteorite-bearing blue ice fields. Results indicate that, unlike the ice fields in the Allan Hills region, the individual ice fields in the Elephant Moraine are all very similar in terms of their meteorite populations. Natural TL levels for meteorites from the Elephant Moraine are generally high, with a significant fraction having TL levels greater than 50,000 rad. This would suggest that, in general, these meteorites have relatively short terrestrial ages, probably less than 100,000 years. Field measurements at the Allan Hills Main field indicating strong northerly ice movements might seem to indicate a connection between the Far-western field at Allan Hills and the Elephant Moraine sites.

E-49807

Boroughs, T.J., Faure, G., Buchanan, D., **Chemical compositions of minerals of the ordinary chondrite (H6) meteorite, RKP86701, from the Reckling moraine, *Antarctic journal of the United States*, 1992, 27(5), p.30-31, 2 refs.**

The meteorite RKP86701 was collected during the 1986-1987 season. It was recovered from the ice field located between the Reckling moraine and the prominent ice ramp along the east side of the moraine and was classified as an H6 chondrite. Its original weight was 176.8 grams. The chemical compositions of the major minerals were determined by electron microprobe (Cameca SX-50) using a thin section (RKP86701.9) provided by the MWG. Tabulated results indicate that the grains of the major minerals (olivine, orthopyroxene, clinopyroxene, chromite, taenite, kamacite, and troilite) are remarkably homogeneous. The silicate minerals as well as chromite contain the correct number of cations compared with the number of oxygen atoms in their respective formulas. Therefore, the minerals in this and other stony meteorites could have crystallized from silicate melts at the time of their formation (4,500 m.y.a.) in much the same way that they still form on the earth today.

E-49808

Hagen, E.H., Faure, G., Buchanan, D., **Recovery of extraterrestrial particles from the Lewis Cliff Ice Tongue using a passive collection system, *Antarctic journal of the United States*, 1992, 27(5), p.31-33, 4 refs.**

The purpose of this field work was to trap spherules in transport after they ablated from the ice to demonstrate that significant quantities of extraterrestrial particles could be trapped with a passive collection system. The experiment was performed during the 1990-1991 field season on the Lewis Cliff ice tongue adjacent to Mt. Achernar. The number of spherules recovered totaled 899, with a total weight of 6.32 mg. Terrestrial sediment was also trapped. The results of the experiment show that abundant spherules are ablating out of the Lewis Cliff ice tongue at the present time and that they can be trapped efficiently with a simple passive collector. A benefit of collecting extraterrestrial particles as they ablate from the ice is that they are not diluted with terrestrial mineral grains, in contrast to till.

E-49816

Stroeven, A.P., Prentice, M.J., Borns, H.W., Jr., **Mt. Fleming Upper Valley Drift: evidence for Neogene glacial history of Antarctica, *Antarctic journal of the United States*, 1992, 27(5), p.51-54, 33 refs.**

Conflicts between hypotheses for antarctic glacial history during the Pliocene are examined. On the basis of Sirius Formation interpretations, the early Pliocene was characterized by warm climates and a dynamic ice sheet. It features ice sheet collapse and subsequent ice sheet overriding. On the basis of unconsolidated drift interpretations, however, the early Pliocene was dominated by polar climates and a stable ice sheet. These divergent hypotheses concerning climate and ice sheet variability have important implications for antarctic ice sheet behavior under warmer climates than today's, and warrant more detailed investigations. The authors' project is to study sediments previously assigned to the Sirius Formation in the McMurdo Dry Valleys region and relate them to the unconsolidated drift deposits there. Here they report some preliminary results.

E-49817

Hall, B.L., Denton, G.H., **Minor expansion of alpine glaciers in Wright Valley, Antarctica, *Antarctic journal of the United States*, 1992, 27(5), p.55-57, 11 refs.**

Information is presented on Plio-Pleistocene alpine glacier activity and paleoclimate in east-central Wright Valley that bears on Pliocene paleoclimate and east antarctic ice sheet dynamics. It is concluded that the last ice flow from East Antarctica seaward through Wright Valley occurred before 3.5 to 3.8 m.y.a. Silty tills, indicative of through-flowing east antarctic ice, all underlie large, bulky Alpine IV moraines dated to 3.5 to 3.8 m.y.a. In addition, any ice-sheet overriding of the Transantarctic Mountains, which necessitates through-flowing ice in Wright Valley, must have occurred before this time. Lack of large ice-sheet expansion since 3.5 to 3.8 m.y.a. is consistent with only a 1 km advance of alpine glaciers, located less than 50 km from the ice sheet. Cold-desert conditions have persisted since at least 3.5 to 3.8 m.y.a. The authors infer this paleoclimate from evidence for cold-based glaciation abundant ventifacts incorporated within alpine glacier drifts, and most important, the lack of temperate ice landforms, such as outwash plains. This evidence suggests that, at least in the Wright Valley sector of the east antarctic ice sheet, air temperatures in the last 3.5 to 3.8 m.y. have never warmed enough to allow superposition of the temperate ablation zones that are necessary for ice-sheet collapse in East Antarctica.

E-49824

Torres G., T., Méon, H., ***Lophosoria* from the Tertiary of King George I. and central Chile [*Lophosoria* del Terciario de isla Rey Jorge y Chile Central: origen y dispersión en el hemisferio Sur], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1993, No.43, p.17-30, In Spanish with English and French summaries. 36 refs.**

Tertiary macro- and microrests similar to *Lophosoria quadripinnata* (Gmel). C.Chr., monotypic fern of the Neotropics and South America were found in the Fildes Formation on King George I. The spore *Cyatheidites annulatus* (Cookson) ex Potonié, similar to *Lophosoria*, was found also in two Tertiary localities in central Chile, Matanzas and La Dehesa. The origin and palaeogeography of the fern *Lophosoria* is discussed. A new species of *Lophosoria antarctica* for the macrorests found in Antarctica is proposed. (Auth.)

E-49825

Torres G., T., **First finding of fossilized wood at Cape Shirreff [Primer hallazgo de madera fósil en Cabo Shirreff, isla Livingston, Antártica], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1993, No.43, p.31-40, In Spanish with English summary. 21 refs.**

The first finding of a fossilized wood specimen on Livingston I. (Cape Shirreff) is reported. The specimen is a silicified coniferous species belonging to the Araucariaceae family (*Araucarioxylon* sp.). The physical characteristics of this fossilized piece are similar to those of others found on Byers Peninsula. The search for other fossil woods on Cape Shirreff will continue in an effort to establish stratigraphic relationships with other localities where similar fossils exist. In addition, a summary of the known findings of fossil plants on Livingston I. is presented, along with a list of the macro- and microflora species which have been identified. (Auth.)

E-49830

Aguayo L., A., Torres N., D., **Census analysis of *Arctocephalus gazella* on Livingston I. [Análisis de los censos de *Arctocephalus gazella* efectuados en el Sitio de Especial Interés Científico No.32, isla Livingston, Antártica], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1993, No.43, p.87-91, In Spanish with English summary. 12 refs.**

Based on a decision made at the CEMP-CCAMLR Meeting held in Viña del Mar in Aug. 1992, the published data from 4 complete censuses on the antarctic fur seal *Arctocephalus gazella*, carried out on Cape Shirreff and San Telmo I., has been re-compiled to determine population changes between the 1965-66 and 1991-92 seasons. Results show that in those 26 years the seal population increased from 50 animals, counted in Jan. 1966, to 10,768 individuals recorded in Jan. 1992. It is recom-

mended that future censuses carried out on Cape Shirreff always include the breeding colonies on San Telmo I., as they all represent the same protected population in the SSSI No.32 area. (Auth. mod.)

E-49833

Geophysical work due north, south of Falkland Islands, *Oil & gas journal*, Dec. 28, 1992, 90(52), p.34.

This note details the licensing of two companies to conduct geophysical surveys of the Falkland Is. continental shelf. The surveys are to begin in early 1993, with results available in the second half of the year.

E-49837

Osborn, J.M., Taylor, T.N., **Pollen morphology and ultrastructure of the *Corystospermales*: permineralized *in situ* grains from the Triassic of Antarctica, *Review of palaeobotany and palynology*, Dec. 1993, 79(3/4), p.205-219, Refs. p.218-219.**

Corystosperms, represented by *Dicroidium* leaves and *Pteruchus*-like pollen organs, are major components of the Early-Middle Triassic silicified flora from the Fremouw Formation of Antarctica. The micro-morphology and ultrastructure of the *in situ* pollen contained within these organs are described. Pollen sacs of varying ontogenetic ages have been isolated. Mature grains are monosulcate and bisaccate, with large crescent-shaped eusacci. The structural features of these grains are discussed with respect to other fossil and extant saccate pollen. The grains are systematically compared with those of other bisaccate pollen-producing plants with which the *Corystospermales* have been suggested to be closely related, including Glossopteridales, Caytoniales, and angiosperms (Lactoridaceae). The permineralized *in situ* grains are also compared with other compressed *Pteruchus* species known at the ultrastructural level and with morphologically similar dispersed palynomorphs known from antarctic sediments. (Auth. mod.)

E-49838

Neish, P.G., Drinnan, A.N., Cantrill, D.J., **Structure and ontogeny of *Vertebraria* from silicified Permian sediments in East Antarctica, *Review of palaeobotany and palynology*, Dec. 1993, 79(3/4), p.221-244, 31 refs.**

Silicified peat of Permian age from Amery Group sediments near Beaver Lake represents a swamp dominated by *Glossopteris*, with little other floristic diversity. Exceptional preservation of small *Vertebraria* axes has allowed detailed investigations into their structure and early ontogeny. *Vertebraria* axes have an exarch actinostele, and are clearly roots. The similarity in tracheid anatomy between *Vertebraria* and abundantly co-occurring *Araucarioxylon* wood is confirmed, further supporting the generally accepted link with the *Glossopteris* plant. Two intergrading types of *Vertebraria* are described: "polyarch" *Vertebraria* and "solid cylinder" *Vertebraria*. These two forms may be conspecific roots with different functions, or they may be different species. The pattern and initiation of primary and secondary tissues are described for the first time. Primary roots consist of a single-layered epidermis surrounding a differentiated outer and inner cortex, and a stele with two to nine protoxylem points delimited by an endodermis. Secondary growth results from a discontinuous vascular cambium that produces radial bands of secondary xylem in the regions alternate to the protoxylem points. Primary stelar parenchyma cells adjacent to the protoxylem points disintegrate under stresses caused by root expansion. These areas are considerably expanded by continued secondary xylem production, forming schizogenous lacunae. These air spaces were present in the living root, and were not filled with aerenchymatous tissue. (Auth.)

E-49842

Takeda, H., Saito, J., Hiroi, T., **New type of antarctic achondrites and their relationship to S asteroids and chondrites, *Nihon gakushiin. Proceedings of the Japan Academy. Series B*, Oct. 1992, 78(8), p.115-120, 19 refs.**

Five meteorites recovered from Antarctica are unique achondrites with coarse-grained orthopyroxene and olivine crystals and variable amounts of Ni-Fe metal and FeS with additional augite or plagioclase. These mineral species can be found in chondrites, which are the most common types among the observed falls. Both Y74357 and MAC88177 contain considerable augite, but Y74357 is richer in olivine. Y791491 contains minor plagioclase. Discovery of such meteorites with coarse-

grained texture and similar major mineral chemistry with extensively modified chondritic bulk chemistries suggests that they are related meteorites with variable amounts of augite and plagioclase and variable degrees of reduction. The variability of mineral abundance can be explained by different degree of removal or segregation of partial melts, by a radiogenic internal heating and a collisional one. Reflectance spectra of some members of this group combined with those of iron meteorites resemble those of S asteroids, common in the main belt. The trend of their variation in mineral assemblage is in line with those of the S asteroids. This model also explains the absence of chondritic asteroids in the main belt, because S asteroids may be modified products of larger chondritic bodies. (Auth.)

E-49856

Buatois, L.A., **Kotick Point Formation (Lower Cretaceous) slope deposits at Stoneley Point, James Ross I.** [Análisis paleoambiental de los depósitos de talud de la Formación Kotick Point (Cretácico Inferior) en el área de Punta Stoneley, Isla James Ross, Antártica (64S)], *Revista geológica de Chile*, Dec. 1992, 19(2), p.145-165, In Spanish with English summary. Refs. p.163-165.

The Kotick Point Formation (Aptian-Albian) exposed at Stoneley Point is interpreted as having been deposited on a fault-controlled slope. Eight lithofacies have been defined, forming 3 distinct depositional elements: slope foot wedge, open slope and sand lobes. Lithofacies A (breccias and conglomerates with projected clasts) and B (graded or massive sandstones) make up the slope foot wedge where sandy debris flows, fluidized flows and high-density turbidity currents were the dominant processes. A large Jurassic glide block is associated with this coarse grained wedge. Lithofacies C (medium-grained conglomerates to coarse sandstones) represents the development of a unique channelized turbidite system. Open slope is represented by lithofacies D (very fine sandstones with lag deposit); E (highly bioturbated medium to fine-grained sandstones); F (parallel stratified tabular sandstones) and G (non-lithified mudstones). The latter is dominant, suggesting suspension sedimentation, whereas the former three represent deposition from sporadic turbidity currents and probable bottom currents reworking. Sand lobes are characterized by progradational cycles of lithofacies H (fine-grained sandstones to mudstones). Intrabasinal tectonism and sea level changes played a major role in slope sedimentation. High sea level and tectonic quiescence are inferred for the deposition of hundreds of meters of mudstone packets. Formation of the slope foot wedge and the channelized turbidite system may have been related to fault reactivation. (Auth.)

E-49869

O'Connell, D.R.H., Stepp, T.M., **Structure and evolution of the crust at the Transantarctic Mountains-Ross Sea crustal transition: results from the Tourmaline Plateau seismic array of the GANOVEX V ship-to-shore seismic refraction experiment**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.229-276, With German and Russian summaries. Refs. p.270-276.

During GANOVEX V two onshore-offshore seismic refraction air-gun profiles were recorded by the Tourmaline Plateau digital seismic array (TPSA) established in the Deep Freeze Range (DFR) of the Transantarctic Mountains (TAM). The 1.2 km long seismic array consisted of 8 vertical geophones and 3 three-component seismometers. Nearly complete seismic refraction profiles were obtained, although data were not recovered from the entire array for most of the profiles. Strong P-wave first arrivals and clear S-wave arrivals are observed up to an offset of 145 km. Water-bottom reverberations were effectively removed by source signature minimum-delay wavelet shaping and bathymetry-dependent predictive deconvolution. The P-wave phases as well as the S-wave phases are clearly observed in the common-shot stacked record sections. Array velocity analysis of vertical-component seismograms demonstrates strong P-SV mode conversions near the Moho. S-wave data are consistent with azimuthal anisotropy with a NNW symmetry axis locally perpendicular to the TAM, but are inconsistent with anisotropy dominated by vertical fractures oriented NNW along the strike of the Rennick Graben or ENE parallel to the TAM front. Maximum depth to seismic Moho beneath the TAM is 22 km at the coast and 26 km at a posi-

tion 30 km inland. To obtain apparent-dip direction and dip angle constraints, common-receiver data were stacked for a small portion of the profiles to yield reversed crustal and Moho apparent P-wave velocities. Moho apparent dip ranges from 3 to 10 deg inboard beneath the TAM. (Auth. mod.)

E-49872

Cochrane, G.R., et al, **Preliminary results of a 1989 seismic refraction survey in the Ross Sea, Antarctica**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.313-333, With German and Russian summaries. 17 refs.

Results from preliminary analysis of sonobuoy seismic-refraction data collected during the 1988-89 austral field season in the Ross Sea show that refraction arrivals from shallow (less than 1 km depth) sedimentary layers and basement rocks are commonly linear, which indicates nearly uniform velocities in relatively thin layers that are probably separated by unconformities cut by glacial processes. Refraction arrivals from deep sedimentary layers, including inferred high-velocity sedimentary rocks filling buried early-rift grabens, are commonly curved; this curvature indicates an increase in velocity with depth that is probably due to sediment compaction and few unconformities. Wide-angle reflections from intrabasement structures occur beneath broad basement rises that are incised by narrow rift grabens; these reflections may be from subvolcanic intrusions and magmatic layers associated with Cenozoic and Mesozoic(?) rifting of the Ross Sea. (Auth.)

E-49873

Hornig, I., **High-Ti and low-Ti tholeiites in the Jurassic Ferrar Group, Antarctica**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.335-369, With German and Russian summaries. 39 refs.

Rocks of the Ferrar Group were sampled from different localities in northern Victoria Land and George V Land in order to compare the extrusive and intrusive rocks termed "Kirkpatrick Basalts" and "Ferrar Dolerite", respectively. Petrographic, mineralogical, and chemical analysis of the samples and comparison with literature data revealed a large overlap in the mineralogical and chemical composition of Ferrar Dolerites and most Kirkpatrick Basalts, which have a low titanium content. Rare high-titanium lavas capping the Kirkpatrick Basalts in some localities differ markedly, however, in the bulk-rock chemical composition of both the extrusive and intrusive low-Ti rocks. Similar incompatible trace element ratios and $^{87}\text{Sr}/^{86}\text{Sr}$ values in both types of rock suggest derivation from a common magma source with different fractionation assemblage involving higher contents of olivine, pyroxene, and predominant plagioclase but no Fe-Ti oxides, indicating even lower pressures and oxygen fugacities during crystallization. A high-Ti lava unit at Litell Rocks consisting of two black, glassy flows showing conchoidal fracturing and a wavy surface is chemically and petrographically identical to high-Ti lavas in the Mesa Range. (Auth. mod.)

E-49874

Jordan, H., Van der Wateren, F.M., **Lakes of Litell Rocks, north Victoria Land, Antarctica: consequences for the deglaciation of the Rennick Valley**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.371-388, With German and Russian summaries. 21 refs.

The ice-free area of Litell Rocks contains more than 100 lakes of up to 1.5 km². Only some of them are ice-free in summer. Radiocarbon dating of lake sediments (algae mud) taken by piston corer yielded ages of up to 4500 years B.P. Former lake shorelines are up to 1600 years old. Field observations, such as striation (two systems) and cryoplanation terraces, favor a Late Wisconsinan to Early Holocene age for the deglaciation of the Litell Rocks area. (Auth.)

E-49875

Schüssler, U., Skinner, D.N.B., Roland, N.W., **Subduction-related mafic to intermediate plutonism in the northwestern**

Wilson Terrane, north Victoria Land and Oates Coast, Antarctica, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89.

GANOVEX V. Edited by D. Danske and J. Fritsch, p.389-418, With German and Russian summaries. 23 refs.

The largest three mafic intrusive complexes of the northwestern Wilson Terrane were investigated with respect to geological position, petrography, and geochemical composition. In terms of age relationships, the mafic intrusives are younger than Ross metamorphism and orogenic tectonism, but older than the emplacement of the Granite Harbour granitoid intrusions, and thus represent an early member of the Granite Harbour intrusive complex. Similarities and differences among the three complexes are briefly outlined and major features of the comparison categories are pointed out. (Auth. mod.)

E-49876

Flöttmann, T., Kleinschmidt, G., **Structure of Oates Land and implications for the structural style of northern Victoria Land, Antarctica, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.419-436, With German and Russian summaries. 30 refs.**

Two major ductile NNW-SSE-trending thrust systems cut across the basement of the Wilson terrane in northern Victoria Land. The high-grade metamorphic basement complex of the central Wilson terrane is detached and thrust east and west over lower grade fore-arc sedimentary rocks along the Wilson and Exiles Thrusts, respectively. The thrusts are interpreted as fore-arc and back-arc thrust systems. The relationships between the granite and the crosscutting thrusts suggest deformation ages of 470-490 Ma. The thrust kinematics indicate displacement normal to the predominant trend of the orogenic belt during westward Paleozoic subduction, and convergence at the paleo-Pacific antarctic craton margin in northern Victoria Land. (Auth.)

E-49881

Del Río, J.L., Gaido, E.S., Walter, M., Camino, M.A., **Coastal sedimentation and dynamics of Potter Cove and the Tres Hermanos Hill peninsula [Aspectos sedimentarios y dinámicos de las playas de caleta Potter y península del cerro Tres Hermanos, isla 25 de Mayo, Shetland del Sur, Antártida Argentina], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1992, No.406, 56p., In Spanish with English and French summaries. 21 refs.**

The field work at Potter Cove and the Tres Hermanos Hill peninsula was based on the topographic survey of 15 profiles perpendicular to the coastal line. Sediment samples of the intertidal and supratidal zones were analyzed using the moment method, and the shape, roundness and sphericity of the psephitic clasts were determined. Results show that the sediments from the low-tide zone are generally thicker and less well selected than those of the high-tide zone, and their granulometric distributions are of a bimodal type, while those of the sediments of the high-tide zone are predominantly unimodal. The asymmetries of size distribution are generally negative in both zones. The psephitic clasts are mostly tabular and equant. In the fraction comprised between -3 and -2 phi the equant and prolate clasts diminish to less than 10% in the samples of the high tide zone. (Auth. mod.)

E-49895

Nemirovskaia, I.A., Romankevich, E.A., **Lipids in bottom sediments of the Atlantic sector of Antarctica, *Oceanology*, 1992 (Pub. Apr. 93), 32(5), p.589-593, Translated from *Okeanologiya*. 10 refs.**

The distribution and makeup of lipids and their content of alkalis and polycyclic aromatic hydrocarbons (PAHs) in bottom sediments of the Scotia and Weddell seas are discussed. The comparatively low concentrations of organic carbon (average 0.35%) and lipids (average 0.024%) result from the rapid decomposition of organic matter in the upper layers of the water column. The composition of the alkanes indicates that the lipids are of autochthonous origin, and the stable concentrations of PAHs indicates that they represent the background level for bottom sediments. The higher concentrations of PAHs in sediments near

King George I. and the different distributions of individual polyarenes are produced by the heating systems of the Polish antarctic station there. (Auth.)

E-49903

Kawasaki, T., Ishikawa, M., Motoyoshi, Y., **Preliminary report on cordierite-bearing assemblages from Rundvågshetta, Lützow-Holm Bay, East Antarctica: evidence for a decompressional *P-T* path?, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.47-56, 24 refs.**

Diagnostic mineral assemblages involving cordierite, sapphirine, orthopyroxene, sillimanite and garnet are newly reported from Rundvågs Head. Cordierite is probably of secondary origin, because it occurs as symplectitic intergrowth with sapphirine at the expense of initial orthopyroxene+sillimanite. In a different domain, vermiculated orthopyroxene+cordierite+/-sapphirine replaces initial garnet locally. On the basis of the textures, the following reactions are inferred: orthopyroxene+sillimanite+quartz=cordierite, orthopyroxene+sillimanite=cordierite+sapphirine, garnet+quartz=orthopyroxene+cordierite, garnet=orthopyroxene+cordierite+sapphirine. These reactions suggest nearly isothermal decompression in the model FMAS system, and along with a prograde kyanite from the same locality, the clockwise *P-T* path of the rocks are confirmed. Moreover, the maximum temperature condition of the Lützow-Holm Complex is estimated to be as high as 900 C, based on the initial orthopyroxene+sillimanite+garnet assemblage; this value is apparently higher than those previously estimated. (Auth. mod.)

E-49904

Asami, M., Grew, E.S., Makimoto, H., **Contrasting mineral associations between two wollastonite-bearing calc-silicate gneisses, eastern Sør Rondane Mountains, Antarctica, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.57-71, 27 refs.**

Calc-silicate gneisses are found at Austhamaren and Eremitten in the polymetamorphic granulite- and amphibolite-facies metamorphic rocks of the eastern Sør Rondane Mountains. The diagnostic assemblage in the Austhamaren calc-silicate is garnet (Grt)-quartz (Qtz)-wollastonite (Wo)-calcite (Cal), whereas Wo-plagioclase (Pl)-scapolite (Scp)-Qtz and Wo-Cal-Scp-Qtz are characteristic assemblages in the Eremitten gneiss. Wollastonite and calcite are nearly end member CaSiO_3 and CaCO_3 . The other major phases approach the calcic end members. Clinopyroxene is hedenbergite ($\text{Fe}/(\text{Fe}+\text{Mg})=0.50-0.67$). The reactions $\text{Grt}+\text{Qtz}=\text{Wo}+\text{An}$ and $\text{Grt}+\text{CO}_2=\text{Wo}+\text{Scp}+\text{Cal}$ relate the assemblages in the Austhamaren and Eremitten samples. The two assemblages could be interpreted to result from a regional pressure decrease from Austhamaren in the north to Eremitten in the south. An alternative interpretation is that the Eremitten Wo-Scp assemblages formed at somewhat higher CO_2 activities, and Wo-An at a slightly higher bulk Na/Ca ratio, compared to the Austhamaren assemblage. (Auth. mod.)

E-49905

Oba, T., Shiraishi, K., **Experimental studies on syenitic rocks in the Yamato Mountains, East Antarctica, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.72-82, 20 refs.**

The stability of amphibole was studied in the presence of syenite composition liquid. The melting relationships of 3 hornblende clinopyroxene quartz syenites and a hornblende 2-pyroxene syenite from the Queen Fabiola Mountains were determined in the temperature range of 650-900 C, under a water pressure of 0.05-0.3 GPa and oxygen fugacities of the FMQ buffer. Experimental results of hornblende clinopyroxene quartz syenites (Y406 and Y904) and one hornblende 2-pyroxene syenite (Y557) at 0.1 GPa show that melting begins between 720 C and 770 C, and amphiboles disappear between 810 C and 895 C. With the increasing temperature at 0.1 GPa, quartz disappears first, then plagioclase and amphibole in that order. The water saturated solidus temperature of a normative quartz-free hornblende clinopyroxene melasyenite (Y405) is about 780 C at 0.1 GPa. K-feldspar in this sample disappears at lower temperature than amphibole. In 2 syenites (Y557 and Y904), solidus and the stability limit line of amphibole intersect at a lower pressure

than 0.3 GPa. Moreover, all rocks investigated are at least 40% melted at temperatures about 50 C above the solidus. Results suggest that amphibole in these syenites could crystallize at pressures lower than 0.3 GPa (10 km in depth), indicating their emplacements at a relatively shallow crustal level. (Auth.)

E-49906

Tainosho, Y., et al, **Preliminary petrological studies of the granitic rocks in the Sør Rondane Mountains, East Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.83-102, 13 refs.

The Sør Rondane Mountains consist mainly of Proterozoic metamorphic rocks and various kinds of Late Proterozoic to Early Paleozoic granitic rocks. The Early Paleozoic granitic rocks can be divided into 2 types, concordant granites and discordant granites. Chemical analyses of major and trace elements for the Early Paleozoic granitic rocks are presented. The discordant granites are characterized by high Ba, Sr and alkalis. In contrast, the concordant granites are higher in Y and Nb and slightly lower in CaO, Cr and Sr. Most of the concordant granites are classified as within-plate granites, while the discordant granites are volcanic arc granites, based on trace elements. Mineral compositions in the granitic rocks are also related to the 2 granite types. Mg/(Mg+Fe) ratios of ferromagnesian minerals of the concordant granites are very low, while those of the discordant granites have intermediate Mg/(Mg+Fe) ratios. Anorthite contents of plagioclases in the concordant granites are low, while those of the discordant granites have slightly higher anorthite content. These chemical features and the Sr initial ratios suggest that these 2 granite types were formed under different conditions. (Auth.)

E-49907

Arima, M., Shiraishi, K., **Geochemical characteristics of metamorphosed high K/Na dykes in eastern Queen Maud Land, Antarctica: ultrapotassic igneous activity linked to Pan-African orogeny**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.103-115, Refs. p.114-115.

Major and trace element abundances and mineralogy of exceptionally potassium-rich metamorphosed dyke rocks are described from Cambrian metamorphic terrains of eastern Queen Maud Land. They are characterized by extremely high K₂O, P₂O₅, Rb, Ba, Sr, Zr, and light rare earth elements. Although the dyke rocks have been metamorphosed to amphibolite facies grade, the geochemical characteristics collectively indicate that their precursors were ultrapotassic mafic igneous rocks of minette or lamproite affinity. The dykes are interpreted as a manifestation of post-orogenic ultrapotassic igneous activity linked to the Pan-African orogeny. (Auth.)

E-49908

Iwata, S., **Uplift of the Sør Rondane Mountains, East Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.116-125, 15 refs.

The Sør Rondane Mountains originated from a marginal swell formed during the breakup of Gondwana, and the area is now in isostatic equilibrium. Altitude of the mountains is estimated to be controlled by the isostatic rebound associated with glacial denudation and ice loading. The denudational depth and extent of ice load subsidence were inferred from topographic cross-sections of subglacial topography. The total mean erosion depth during 30 Ma since the preglaciation was approximately 1.3 km with an associated rebound of 1.1 km. As a result of the uplift, the summit altitude in the preglacial time is estimated to have been 2.1 km above the present sea level. The average rates of the denudation and surface uplift are 43 m/My and 37 m/My, respectively. (Auth.)

E-49909

Kagami, K., **Seismic stratigraphy, tectonics and ice sheet configuration of continental margin sequences in the Belling-shausen Sea, West Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of

Polar Research, 1993, p.126-135, 21 refs.

Recent advances in sequence stratigraphy indicate that the stratigraphic signature in the antarctic continental shelf profiles could serve as a gage of tectonics and ice sheet configuration change during the Neogene. To accomplish this purpose, the author re-examines two profiles from the continental shelf off Adelaide I. The layers of S4 are recognized at the base of the continental slope as an accretional sediment and at the mid-shelf high as a tectonically uplifted stratum before and during oceanic ridge crest to trench (RC-T) collision. The age of S4 is assigned to be Early Miocene and the RC-T collision occurred in the Middle Miocene. During the following subsidence period in the Late Miocene, S3 and S2 were deposited as seaward progradational sequences in a passive margin condition. The sequence boundary between S2 and S1 was interpreted to be produced by shelf edge grounding of ice sheets after a period of large deglaciation in the Early Pliocene. The boundary corresponds to the time when the levee channel complexes were formed in the slope fan areas. The S1 reflects more frequent ice sheet grounding in the Pleistocene. (Auth.)

E-49928

Optimism surrounds preliminary seismic data from Falk-lands, *Offshore engineer*, Dec. 1993, p.8.

Analysis of preliminary offshore seismic surveys on the continental shelf surrounding the Falkland Is. indicates sediment volumes consistent with substantial hydrocarbon reserves. These results precede the licensing of offshore exploration and drilling rights, now scheduled for inauguration in July 1994 under the auspices of the United Kingdom.

E-49935

Vogt, S., et al, **Exposure history of the lunar meteorite, Elephant Moraine 87521**, *Geochimica et cosmochimica acta*, Aug. 15, 1993, 57(15), p.3793-3799, 30 refs.

Reported here are the noble gas concentrations and the ²⁶Al, ¹⁰Be, ³⁶Cl, and ⁴¹Ca activities of the antarctic lunar meteorite Elephant Moraine 87521. Although the actual exposure history of the meteorite may have been more complex, the following model history accounts satisfactorily for the cosmogenic nuclide data: a first stage of lunar irradiation for about 1 Ma at a depth of 1-5 g/cm² followed, not necessarily directly, by a second one for 26 Ma at about 565 g/cm², launch from the Moon less than 0.1 Ma; and arrival on Earth 15-50 ka. The small concentration of trapped gases shows that except for some material that may have been introduced at the moment of launch, EET 87521 spent <1 Ma at a lunar depth <1 g/cm². EET 87521 has a K/Ar age in the range 3.0-3.4 Ga, which is typical for lunar mare basalts. (Auth.)

E-49938

Niedermann, S., Graf, T., Marti, K., **Mass spectrometric identification of cosmic-ray-produced neon in terrestrial rocks with multiple neon components**, *Earth and planetary science letters*, July 1993, 118(1/4), p.65-73, 27 refs.

Studies of cosmic-ray-produced nuclides in terrestrial rocks are expected to provide important geomorphological and glaciological information, such as surface exposure ages, erosion rates and extent of glacial cover. In the case of the stable nuclide ²¹Ne, the cosmic-ray-produced component may represent but one of several components, and a component resolution based on three-isotope correlations is essential. Analytical techniques were developed which permit accurate corrections for all interfering ions. It is shown (for a modified Nier source) that corrections for doubly charged species based on constant charge state ratios are not satisfactory. The improved techniques permit isotopic studies of <10⁶ atoms of ²¹Ne. The spallation ratio (²²Ne/²¹Ne)_c from Si was calibrated using a quartz separate from an Allan Hills sandstone and yields a value of 1.243. This ratio is expected to be essentially constant for terrestrial quartz samples and should be useful in component resolutions. The stepwise release of Ne at increasing temperatures shows that cosmic-ray-produced Ne is released from quartz at rather low temperatures. This permits an estimate of the activation energy for Ne diffusion in quartz (90 kJ/mol). (Auth.)

E-49941

Gregoire, M., et al, **Oceanic mafic granulite xenoliths from the Kerguelen archipelago**, *Nature*, Jan. 27, 1994, 367(6461),

p.360-363, 41 refs.

Oceanic plateaus are large accumulations of volcanic and plutonic rocks on the ocean floor, whose detailed nature and origin are only poorly understood. Their immense volumes, frequent occurrence since the Cretaceous period and conspicuous presence in all major ocean basins point to their significance in understanding the Earth's thermal and chemical evolution. The authors report here the discovery of mafic granulite xenoliths from Kerguelen Is. at the northern end of the Kerguelen plateau—one of the two largest oceanic plateaus. Granulites are normally found only in continental settings, where the crust is thick enough to experience the high temperatures and pressures required for granulite-facies minerals to form. The Kerguelen xenoliths are thought to represent basaltic magmas underplated during the evolution of the plateau. More generally, such mafic granulites may be an important constituent of the lower parts of oceanic plateaus, which are inaccessible to drilling. (Auth.)

E-49944

Hole, M.J., Kempton, P.D., Millar, I.L., **Trace-element and isotopic characteristics of small-degree melts of the asthenosphere: evidence from the alkalic basalts of the Antarctic Peninsula**, *Chemical geology*, Oct. 25, 1993, 109(1/4), p.51-68, 51 refs.

Miocene-Recent continental alkalic basalts were erupted along the Antarctic Peninsula as a result of decompressional melting of the asthenosphere caused by the formation of slab-windows beneath the continental margin following the cessation of subduction. The basalts appear not to be related to a period of major lithospheric attenuation, nor were they formed as a result of the influence of a mantle plume. They exhibit strong trace-element and isotopic affinities. Correlated Pb-Sr-Nd isotope and trace-element behavior suggests that the asthenosphere from which these basalts were derived was subjected to multiple melt extraction/depletion events. One period of melt extraction was ancient and similar to that affecting MORB source mantle, and was followed by a more recent (?Mesozoic) event. This resulted in increased U/Pb, U/Nb and U/Th ratios and further depletion in ultra-incompatible elements such as Rb and Ba, causing high K/Rb and K/Ba ratios in the erupted lavas. This implies that the asthenosphere beneath the Antarctic Peninsula is heterogeneous on a small scale. Small-degree melts are capable of sampling geochemically, and possibly mineralogically, distinct mantle domains from larger-degree melts. During larger degrees of partial melting, the scale of melting approaches the scale of heterogeneity, and integration of melts from different geochemical domains occurs. (Auth. mod.)

E-49971

Hole, M.J., Larter, R.D., **Trench-proximal volcanism following ridge crest-trench collision along the Antarctic Peninsula**, *Tectonics*, Aug. 1993, 12(4), p.897-910, 36 refs.

On the basis of multichannel seismic reflection, magnetics and bathymetry data, a Pleistocene-Holocene (<0.1 Ma) volcanic seamount has been identified very close to the shelf edge off the west coast of the Antarctic Peninsula. The seamount overlies the subducted trace of a transform fracture zone which divides segments of the margin along which collision took place 3.1 and 6.0 Ma. New trace element and isotopic data from dredged samples demonstrate that the seamount appears to be predominantly formed of relatively primitive undersaturated alkali basalt. The basalts have geochemical signatures that are indistinguishable from ocean island basalts and some continental alkali basalts. Geochemical similarities with other more trench distal postsubduction alkalic basalts along the Antarctic Peninsula are striking, strongly implying that all the postsubduction basalts were derived from a chemically similar asthenospheric source region. The basalts were most likely to have been generated as a result of the formation ridge crest-trench collision. Subduction component-free subslab asthenosphere upwelled into the incipient void left by the continued sinking of the leading plate following collision, and decompressional melting resulted. This type of trench-proximal volcanism following ridge crest-trench collision differs from that in other locations where calc-alkaline volcanism persisted or ophiolite obduction occurred. (Auth. mod.)

E-49973

Langenauer, M., Krähenbühl, U., **Halogen contamination in**

antarctic H5 and H6 chondrites and relation to sites of recovery, *Earth and planetary science letters*, Dec. 1993, 120(3/4), p.431-442, 27 refs.

The distribution of elements F, Cl, Br and I was analyzed in layers removed stepwise from antarctic H5 and H6 chondrites, showing higher concentrations on the surface than in the interior of the meteorites. The degree of halogen enrichment cannot be correlated with the degree of visual weathering and is proportional to the time the meteorites were residing on the surface of antarctic ice, while aerosols, salts and gaseous components were deposited on the surfaces of the meteorites and diffused into their interior. The major contamination source for F, Cl and probably Br is air-borne seaspray. Methyl iodide and its oxidation products formed in the antarctic atmosphere (e.g., I₂), can be transported over longer distances to the interior of Antarctica than air-borne seaspray. Therefore, the ratio of the halogen contamination is related to the collection site of the meteorites. All meteorites that were found in the antarctic interior are contaminated to a lesser degree by F, Cl and Br relative to I than those found near the coast. The measured enrichment ratio of I/F is a function of the distance between the collection site and the open sea, and increases from the Allan Hills to the Thiel Mountains. By finding the degree of contamination of a meteorite it is possible to determine its maximum surface residence time on the antarctic ice. (Auth. mod.)

E-49974

Benoit, P.H., Sears, D.W.G., **Recent meteorite shower in Antarctica with an unusual orbital history**, *Earth and planetary science letters*, Dec. 1993, 120(3/4), p.463-471, 30 refs.

A thermoluminescence (TL) survey of meteorite samples recovered by the 1988/89 European expedition and pre-1988 American expeditions to the Allan Hills main blue ice field resulted in the discovery of 15 meteorites with very high TL levels (>100 krad at 250 C in the glow curve). It is likely that these samples are fragments of a single meteoroid body which fell very recently and experienced a decrease in orbital perihelia from more than 1.1 AU to 1 AU within the last 10⁵ yr. Carbon-14 data for two of the samples confirm their young terrestrial age compared to most antarctic meteorites. Studies of the cosmogenic isotopes in at least one non-antarctic meteorite which also has very high natural TL, Jilin, indicate that the meteorite experienced a multi-stage irradiation history, the most recent stage being 0.4 Ma in duration following a major break-up of the object. These meteorites, and the few equivalent modern falls, are the only documented samples from bodies which were recently in Earth-approaching (Amor) orbits (i.e., with perihelion >1.0 AU), as opposed to the Earth-crossing (Apollo) orbits which are the source of most other meteorites. Their rarity indicates that such rapid orbit changes are unusual for meteoroid bodies and may be the result of isolated large break-up events. (Auth. mod.)

E-49975

Smith, D.G.W., Miura, Y., Launspach, S., **Fe, Ni and Co variations in the metals of some antarctic chondrites**, *Earth and planetary science letters*, Dec. 1993, 120(3/4), p.487-498, 25 refs.

Nearly 4,000 Fe, Ni and Co analyses have been carried out on the metal phases of 12 antarctic chondritic meteorites by electron microprobe. H-group chondrites show relatively simple patterns of variation for these elements but L- and LL-group members show much more scatter in both Ni and Co concentrations. A single member of the CO3 group investigated shows some scatter in the concentrations and also much higher Co concentrations in the high-Ni (awaruite?) phase (1.25-2%) than in the coexisting kamacite (0.2-0.5%). Thus, analysis of the metal phases can provide not only a means of identifying the group to which a meteorite belongs, but also the possibility of distinguishing between individual chondrites from the same group. The overall concentrations of Co in the metal particles in the different groups are considered to be related inversely to the abundance of metal grains in meteorites of these groups, while the scatter is interpreted as reflecting characteristics inherited at the time of accretion. The absence of homogenization of the concentrations of Fe, Ni and Co in the metal particles, even in so-called equilibrated chondrites, provides further evidence against the widely held notion that these meteorites have been involved in a high-temperature prograde metamorphism. (Auth.)

E-49986

Jwa, Y.J., Lee, J.I., **Geochemistry of the volcanic rocks from the Fildes Peninsula, King George Island, Antarctica, Korea Ocean Research and Development Institute. Collected reprints**, 1992 (Pub. 1993), Vol.9, p.53-64, Reprinted from Journal of the Korean Earth Science Society, 1992, Vol.13, No.2, p.200-211. In Korean with English summary. 9 refs.

Tertiary volcanic activity in the Fildes Peninsula can be divided into three stages (I, II, III) of magmatism. The evolutionary process of each stage was examined from its geochemical characteristics. For stage I, olivine, orthopyroxene and clinopyroxene of low Fe/Mg ratio as well as Ca-plagioclase begin to crystallize and fractionate. Stage II magma, which is more differentiated than stage I magma, shows the fractionation of Ca-plagioclase and olivine and orthopyroxene of high Fe/Mg ratio. Stage III magma, which is slightly more differentiated than stage I magma but less than stage II magma, intruded into the area when stage II magmatism was weakened. The volcanic rocks on the Fildes Peninsula show, as a whole, tholeiitic natures. From the previous studies on Sr isotopic ratio, the origin of the volcanic magma in the area was assumed to be upper mantle. Accordingly, the volcanic rocks in the area were originated from tholeiitic magma which were generated by the partial melting of upper mantle under the island-arc environment. (Auth.)

E-49990

Marensi, S.A., Reguero, M.A., Santillana, S.N., Vizcaino, S.F., **Eocene land mammals from Seymour Island, Antarctica: palaeobiogeographical implications**, *Antarctic science*, Mar. 1994, 6(1), p.3-15, Refs. p.13-15.

Middle Eocene land mammals from La Meseta Formation, Seymour I. are reviewed. A taxonomically diverse fossil land-vertebrate assemblage with small and medium-size mammals has been recovered from four localities. The depositional setting is shallow marine and most of the mammal-bearing beds are in reworked, moderate to high energy subtidal facies. The characteristics of these mammals not only confirm but also strengthen the biogeographical relationships between southern South America (Patagonian Province) and the Antarctic Peninsula during the Paleogene, and rule out the possibility of a major barrier between these areas. The antarctic ungulates (*Astrapotheria* and ?*Litopterna*) are pleisomorphics in retaining low crowned cheek teeth, and are more similar to those from the Pancasamayoran local faunas of southern South America (Patagonia). (Auth.)

E-49995

Roser, D.J., Seppelt, R.D., Nordstrom, O., **Soluble carbohydrate and organic acid content of soils and associated microbiota from the Windmill Islands, Budd Coast, Antarctica**, *Antarctic science*, Mar. 1994, 6(1), p.53-59, 31 refs.

In the cold antarctic environment, labile organic compounds may accumulate in soil due to relatively low utilization rates by heterotrophic microorganisms. Microbial fermentation of these compounds might contribute to the development of strongly acid soils. To test this and assess concentrations, extracts of a range of soils in the Windmill Is. were analyzed. Concentrations of sugars and polyols up to 3300 mg/g were detected in cryptogam-dominated soils. Some, such as trehalose, may have principally originated in the soil microflora. Soils from occupied penguin rookeries were found to possess oxalic, acetic, propionic and succinic acids at levels up to 1000 mg/g soil. Most other soils, however, lacked these acids at detectable levels (1-5 mg/g soil). No correlation was established between organic acid accumulation and soil pH, although those dominated by moss and lichen had been acidified significantly when compared with barren soils. Thus while substantial pools of these readily utilized carbohydrates were probably present in cryptogam-dominated soils, there was little accumulation of organic acids which could account for the acidity of mineral soils typical of the Windmill Is. (Auth.)

E-49998

Arne, D.C., **Phanerozoic exhumation history of northern Prince Charles Mountains (East Antarctica)**, *Antarctic science*, Mar. 1994, 6(1), p.69-84, Refs. p.82-83.

Apatite fission-track data from samples of Precambrian basement, Late Permian-Triassic sedimentary rocks and inferred Cretaceous intrusive bodies are used to constrain the low-temperature (i.e. sub 110 C) thermal history of the northern Prince Charles Mountains. Two discrete phases of cooling have been identified, both of which are attributed to regional exhumation associated with rifting episodes. A phase of late Palaeozoic cooling that began during the Carboniferous is inferred to have been associated with the initial formation of the Lambert Graben. A more recent phase of cooling was initiated during the Early Cretaceous and is estimated to have locally involved the removal of at least 2 km of material using an assumed palaeotemperature gradient of 25 C/km at the time of cooling. This latter phase of exhumation was closely accompanied by the emplacement of a variety of mafic alkaline rocks at ambient palaeotemperatures less than 60 C, and was probably related to renewed extension of the Lambert Graben during the breakup of eastern Gondwana. The results of this study suggest that final exhumation of high-grade Precambrian basement of the northern Prince Charles Mountains was largely controlled by Phanerozoic rifting events. (Auth.)

E-49999

Hole, M.J., Storey, B.C., LeMasurier, W.E., **Tectonic setting and geochemistry of Miocene alkalic basalts from the Jones Mountains, West Antarctica**, *Antarctic science*, Mar. 1994, 6(1), p.85-92, Refs. p.91-92.

Within the Jones Mountains, which form part of the Thurston I. crustal block, up to 700 m of Miocene (c. 10 Ma) pillow basalt and palagonitized volcanoclastic rocks unconformably overlie Jurassic granitic basement and Cretaceous volcanic rocks and dykes. New geochemical analyses demonstrate the alkalic nature of the basalts, which range in composition from alkali basalt to basanite. Unradiogenic Sr-isotope ratios (0.7031-0.7034), coupled with low LILE/HGSE ratios (e.g. Th/Ta c. 1.4, Rb/Nb 0.3-0.9) indicate a predominantly asthenospheric source for the basalts. The Jones Mountains basalts are geochemically similar to the alkalic basalts of Marie Byrd Land, but have consistently lower K/Ba and higher Ba/Nb ratios than Late Cenozoic alkalic basalts along the Antarctic Peninsula. These regional variations in geochemical composition apparently reflect differences in tectonic setting and are not the result of lithospheric interaction or partial melting/crystallization effects. The generation of alkalic magmas along the Antarctic Peninsula was causally related to the formation of slab windows following ridge crest-trench collision and the cessation of subduction, whereas the Jones Mountains alkalic basalts may represent the expression of the northward propagation of the head of the Marie Byrd Land plume. (Auth.)

E-50000

Woolfe, K.J., **Cycles of erosion and deposition during the Permo-Carboniferous glaciation in the Transantarctic Mountains**, *Antarctic science*, Mar. 1994, 6(1), p.93-104, Refs. p.102-104.

At two localities adjacent to Hatherton Glacier, Darwin Mountains, a thick glacio-lacustrine sequence underlies the main diamictite facies of the Darwin Tillite (Metschel Tillite), and at one of these locations a glacio-lacustrine sequence also conformably overlies the diamictite. These deposits record the initial advance and final retreat of the Gondwana ice cap. Other pro- and periglacial phases within these sequences record several minor advances and retreats of the ice sheet. Carbonaceous sediments above and below the main diamictite phase show that vegetation was established near the ice margin, suggesting that present-day ice margin temperatures are colder than those experienced during the Permo-Carboniferous (Gondwana) glaciation. It appears that there was little or no erosion of the Devonian Taylor Group which underlies the glacial sequence. The apparent erosional nature of the contact between the Permo-Carboniferous glacial sequence and the overlying Permian coal measures is attributed to surface winnowing of unconsolidated tills and locally the units are conformable. (Auth.)

E-50001

Shen, Y.B., **Jurassic conchostracans from Carapace Nunatak, southern Victoria Land, Antarctica**, *Antarctic science*, Mar. 1994, 6(1), p.105-113, 29 refs.

Fossiliferous horizons of the Ferrar Group at Carapace Nunatak of southern Victoria Land have yielded the richest and most diverse freshwater Jurassic biota hitherto recorded from Antarctica. Fossil conchost-

racans are the most important in terms of number of individuals and distributional area. Scanning electron microscopy is used to establish a new genus and species (*Carapacestheria balli*), and *Cyzicus (Lioestheria) disgregaris* Tasch is attributed to *Carapacestheria disgregaris* (Tasch) emend. The conchostracan fauna of the Ferrar Group, characterized by *Carapacestheria*, is probably of early Middle Jurassic age. (Auth.)

E-50011

Melick, D.R., Bölter, M., Möller, R., **Rates of soluble carbohydrate utilization in soils from the Windmill Islands Oasis, Wilkes Land, continental Antarctica**, *Polar biology*, Jan. 1994, 14(1), p.59-64, 26 refs.

A time course study of the fate of glucose, sucrose, and arabinol added to surface soils collected from vegetated and bare sites near Casey Station was performed using gas-liquid chromatography. For both soils, hydrolysis of added sucrose was observed after 24 hours. Following 168 hours incubation at both 5 C and 15 C, hydrolysis of sucrose to glucose and fructose was greater than 95%. Maximum rates of sugar uptake were observed in soils from the vegetated site incubated at 15 C. After 168 hours 44%, 52% and 94% of the added arabinol, glucose and sucrose respectively had been consumed. There did not appear to be any cell-free extracellular enzymatic activity in the soils, as levels of added sucrose, trehalose and maltose within soil water extracts showed no change after 168 hours incubation. The results are discussed in relation to earlier work on the microbial activity of antarctic soils and the sources of carbohydrate input into this ecosystem. (Auth.)

E-50025

Heimann, A., Fleming, T.H., Elliot, D.H., Foland, K.A., **Short interval of Jurassic continental flood basalt volcanism in Antarctica as demonstrated by $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology**, *Earth and planetary science letters*, Jan. 1994, 121(1/2), p.19-41, 84 refs.

A continental flood basalt province, the Ferrar Group (Kirkpatrick Basalt and Ferrar Dolerite), crops out along 3000 km of the Transantarctic Mountains and is temporally related to the break-up of Gondwana. Although a wide range of dates between 90 and 193 Ma have been published for the Kirkpatrick Basalt, it is now recognized that the young dates reflect non-ideal behavior of Ar in the matrix. In order to refine the geochronology, feldspar separates have been analyzed by the $^{40}\text{Ar}/^{39}\text{Ar}$ incremental heating method. The main objectives are to constrain the duration of extrusive activity and the timing of volcanism along the outcrop belt. The Jurassic volcanism in Antarctica represents a short episode of magmatism, comparable in duration with other well-dated continental flood basalt provinces. The linearly extensive outcrop of the Ferrar Province and the rapid eruption of the lavas suggests that lithospheric stretching exerted a major control on magmatism. The poorly constrained age of the Bajocian-Bathonian boundary makes the previously suggested connection between Ferrar volcanism and an extinction event at that boundary uncertain. (Auth. mod.)

E-50038

Hergt, J.M., Peate, D.W., Hawkesworth, C.J., **Petrogenesis of Mesozoic Gondwana low-Ti flood basalts**, *Earth and planetary science letters*, July 1991, 105(1/3), p.134-148, 45 refs.

DLC QE1.E12

New major trace element and isotopic data for Jurassic basalts from SE Australia indicate that they are strikingly similar to the Jurassic tholeiitic rocks of Tasmania and the Transantarctic Mountains. These rocks are all characterized by low TiO_2 , P_2O_5 , Na_2O , Fe_2O_3 , Ti/Zr, Ti/Y and high SiO_2 , Rb/Ba, Rb/Sr, $^{87}\text{Sr}/^{86}\text{Sr}$ and $^{207}\text{Pb}/^{204}\text{Pb}$, relative to oceanic basalts. They therefore comprise a major province, termed the Ferrar magmatic province, which extended for 3000-4000 km across the Gondwana supercontinent. A review of the other Mesozoic low-Ti CFBs suggests that the Ferrar rocks are an extreme example of these magma types. It is striking that both the major and trace element compositions are different from oceanic basalts, which suggests that these features are linked, and it is argued that they were derived from distinctive source regions in the sub-continental mantle. Such source regions were variably depleted in major and minor elements, and then relatively enriched in highly incompatible elements and Sr and Pb isotopes, which

is best explained by the introduction of a small amount of subducted sediment. The tectonic setting of the Ferrar magmatism is poorly constrained, but at present there is no clear geochemical evidence for the involvement of asthenospheric plume material in the petrogenesis of these low-Ti CFBs. (Auth.)

E-50069

Campanella, L., Ferri, T., Petronio, B.M., Pupella, A., **Chemistry of humic substances in antarctic sediments** [Indagini chimiche relative a sostanze umiche provenienti da sedimenti marini antartici], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.127-129, In Italian with English and Spanish summaries.

Humic and fulvic acids extracted from marine sediments coming from Terra Nova Bay have been characterized using different techniques. Results obtained were compared with those reported in the literature. The differences found are pointed out and presented in a table. (Auth.)

E-50101

Valenzuela, E., **Chilean marine geology and antarctic research** [Geología marina: estado actual y perspectivas], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.433-436, In Spanish with Italian and English summaries. 5 refs.

It is reported that Chile has a modest infrastructure, a reduced group of specialists, and lacks financial resources. In northern Chile there is a regional program oriented to the investigation of mineral and energetic resources, supported by both national and international agencies. For the antarctic and subantarctic regions there is no such program at present. It is suggested that the study of the sediments of the magellanic basins and from the South Shetland Is. could provide important biological and oceanographic information from the Miocene to Recent time. (Auth. mod.)

E-50106

Benoit, P.H., Roth, J., Sears, H., Sears, D.W.G., **Natural thermoluminescence of meteorites. 7. Ordinary chondrites from the Elephant Moraine region, Antarctica**, *Journal of geophysical research*, Jan. 25, 1994, 99(E1), p.2073-2085, 38 refs.

Natural and induced thermoluminescence (TL) measurements for meteorites from the Elephant Moraine region are reported. The dataset comprises 107 samples and represents at most 73 separate meteorite falls. Pairing groups are generally confined to single icefields or to adjacent icefields, but a small proportion cross widely separated icefields in the region, suggesting that the fields can be considered as a single unit. Meteorites from this region have high natural TL levels, which indicates that they have small terrestrial surface exposure ages (<12,500 years). There do not appear to be significant differences in natural TL levels (and hence surface exposure ages) between individual blue icefields in the region. The proportion of reheated meteorites from the Elephant Moraine region is similar to that of other antarctic sites and modern falls, consistent with the uniformity of the meteoritic flux in this regard. An unusual subset of H-chondrites with high induced TL peak temperatures is absent among the data for meteorites collected in the Elephant Moraine region, which stresses their similarity to modern falls. It is suggested that the Elephant Moraine icefields formed through shallow ablation of the ice. Unlike the Allan Hills sites to the south, lateral transport is probably less important relative to the infall of meteorites in concentrating meteorites on these icefields. (Auth. mod.)

E-50107

McLoughlin, S., Long, J.A., **New records of Devonian plants from southern Victoria Land, Antarctica**, *Geological magazine*, Jan. 1994, 131(1), p.81-90, 53 refs.

An assemblage of fossil plants is recorded here from the Middle Devonian Beacon Heights orthoquartzite and overlying Aztec siltstone (Taylor Group), of the Cook Mountains and Skelton Névé regions, southern Victoria Land. The Beacon Heights orthoquartzite exposed in the southern Cook Mountains yielded specimens of the lycopods *Hap-*

lostigma lineare, *Malanzania* sp., and *Archaeosigillaria* sp. cf. *A. caespitosa*. The Aztec siltstone flora contains *Praeramunculus alternatiramus* and *H. lineare*. (Auth.)

E-50113

Robert, C., Kennett, J.P., **Antarctic subtropical humid episode at the Paleocene-Eocene boundary: clay- mineral evidence**, *Geology*, Mar.1994, 22(3), p.211-214, 22 refs.

Clay-mineral assemblages from East Antarctica have been analyzed at high stratigraphic resolution (20 to 1 ka) throughout the interval from 55.6 to 55.0 Ma, which includes the terminal Paleocene isotopic excursion in Ocean Drilling Program Site 690B on Maud Rise (lat 65S) in the Weddell Sea region. Changes in the clay associations reflect a major increase in chemical weathering caused by increased temperature and/or rainfall in at least this sector of East Antarctica for a brief (270 ka) interval in the latest Paleocene. This represents the most intense warming known for the Cenozoic. This high-latitude climatic episode is recorded synchronously by stable isotopes and clay minerals. A progression is evident in the clay assemblages during the latest Paleocene that apparently reflects changing relations between temperature and precipitation. Clay-mineral variations in Antarctica during the isotopic excursion reflect a tight coupling between oceanic and continental climate change. Immediately following the excursion at 55.22 Ma, kaolinite percentages increased to values similar to modern subtropical-tropical areas for 150 ka, a remarkable event for the Antarctic. A temporary change in atmospheric circulation is suggested from dominantly zonal to meridional. (Auth. mod.)

E-50125

Hill, R.S., Truswell, E.M., **Nothofagus fossils in the Sirius Group, Transantarctic Mountains: leaves and pollen and their climatic implications**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.67-73, Refs. p.72-73.

Glacially deposited sediments of the Sirius Groups in the Transantarctic Mountains have yielded wood, leaf, and pollen fossils, all of which can be shown, on the basis of the present evaluation, to represent a single species of the southern beech, *Nothofagus*. This paper presents new data on the morphology and affinities of both leaves and pollen and discusses the implications of this information for climatic reconstruction. The leaves show considerable similarity to those of the extant Tasmanian subalpine to alpine species *Nothofagus gunnii*, although there are differences. Pollen of *Nothofagus* recovered from the unit all belongs to a single fossil species and most closely resembles the species *Nothofagidites lachlaniae*, first described from the Pleistocene of New Zealand. Although problems of interpretation remain, it can be argued that *N. lachlaniae* belongs to the same pollen group as *N. gunnii*, showing a consistent affinity between leaf and pollen remains. There is nothing to suggest that any of these fossils are recycled. All organs preserved reflect a stunted, impoverished plant community dominated by a single species of *Nothofagus*, existing probably under extreme conditions, but nevertheless requiring temperatures as high as 5 C for at least 3 months of the year, as well as supplies of liquid water during the summer. (Auth.)

E-50126

Cooper, A.K., Eittreim, S., Ten Brink, U., Zayatz, I., **Cenozoic glacial sequences of the antarctic continental margin as records of antarctic ice sheet fluctuations**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.75-89, Refs. p.88-89.

Seismic reflection profiles across the antarctic continental margin show thick Cenozoic prograding sequences (CPS) of likely glacial and interglacial origin unconformably overlying preglacial Paleozoic, Mesozoic and Cenozoic sedimentary and basement rocks. Many parts of the continental shelf, underlain by CPS, may have been permanently overdeepened (>150 m water) like today, at glacial onset and initial advance(s) of marine-based grounded ice sheets across the continental shelf. Subsequently, glaciomarine strata were deposited as topset and foreset strata on the overdeepened shelf by nearby grounded ice sheets. Later grounded ice sheets eroded, reworked, and redistributed strata to

give the present bathymetric profile that includes glacially shaped banks and troughs. The banks are underlain by varied geometries, but principally topset strata that are thicker under shallower banks. The CPS have similar geometries on different parts of the continental margin and contain unconformities that can sometimes be traced across the margin. The similarity and continuity suggest that the CPS are good sites to core and drill along transects to resolve longstanding debates about circum-Antarctic Cenozoic paleoclimatic (ice volume), paleoceanographic (sea level), and paleogeographic events in the southern ocean and antarctic regions. Such drilling would also link the proximal shelf record (mostly unsampled) with the distal ocean record (highly sampled). A general transect drilling strategy is suggested. (Auth.)

E-50127

Hambrey, M.J., Barrett, P.J., **Cenozoic sedimentary and climatic record, Ross Sea region, Antarctica**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.91-124, Refs. p.120-124.

Cored lithologies suggest that from early Oligocene to the late Pliocene or even early Pleistocene, the antarctic ice sheet appears to have been largely temperate, more extensive and more dynamic than the present polar ice sheet. Cores from coastal Victoria Land reveal Pliocene ice advancing periodically from the Transantarctic Mountains and Pleistocene ice grounded across the Ross Sea in response to expansion of the East Antarctic and West Antarctic ice sheets. Outcrops of glacial Sirius Group in the Transantarctic Mountains bear late Pliocene marine diatoms, considered to have been transported from the antarctic interior, and *in situ* leaf and pollen remains of *Nothofagus*, implying a major recession of the ice sheet at that time. The Quaternary record both onshore and offshore is thin and incomplete, as a result of erosion by successive advances of grounded ice across the shelf. Comparison with drill hole and terrestrial evidence from other parts of the antarctic continental margin and deep ocean suggests that the sediments are recording continent-wide ice sheet and climatic fluctuations. Further drilling on the antarctic margin should seek to extend the climatic history back beyond the Oligocene and to provide more detail and better chronology for critical periods such as the Pliocene and the last glacial cycle. (Auth. mod.)

E-50128

Jenkins, D.G., **Cenozoic southern mid- and high-latitude biostratigraphy and chronostratigraphy based on planktonic foraminifera**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.125-144, Refs. p.142-144.

An essential part of the Cenozoic biostratigraphy of the southern middle and high latitudes has been based on the stratigraphic ranges of planktonic foraminifera. Sequences derived from the Deep Sea Drilling Project and the Ocean Drilling Program (ODP) have been subdivided into biozones, and datum planes based on biostratigraphic events have been used for intersite correlation. The accuracy and reliability of the methodology of using datum planes is discussed. Zonations have been established for the southern mid- latitudes, and these are discussed in relation to the low-latitude zonations. More recently, the ODP has recovered sequences from Maud Rise and the Kerguelen Plateau, and high- latitude zonal schemes have been established; these zones have been correlated with the southern mid-latitude zonation. The sequential zonations of the southern middle and high latitudes are discussed within the Cenozoic chronostratigraphic series boundaries; the identification of these boundaries becomes progressively more difficult with increasing latitude but should improve with the establishment of international boundary stratotypes. (Auth.)

E-50131

McCartney, K., Wise, S.W., Jr., **Unusual silicoflagellate skeletal morphologies from the Upper Miocene-Lower Pliocene: possible ecophenotypic variations from the high-latitude southern oceans**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett

and D.A. Warnke, p.195-206, 16 refs.

Six unusual morphotypes of the silicoflagellate subspecies *Dis-tephanus speculum speculum* constitute the "pseudofibula plexus," the distribution of which is concentrated in uppermost Miocene-lowermost Pliocene sediments centered around the antarctic continent. The occurrence of this plexus in antarctic and subantarctic waters seems to correlate with the Late Miocene-Early Pliocene glaciations of the continent. Therefore some type of ecologic control is suspected to account for its distribution in time and space. Distribution maps show that members of the plexus dominate silicoflagellate assemblages closest to the continent (class I province) but that their numbers diminish away from the continent (through class II and class III provinces), as does the thickness of the interval they occupy; thus the stratigraphic boundaries of the plexus may be diachronous. Only at Ocean Drilling Program Site 704 on Meteor Rise does the plexus occur in a continuous pelagic carbonate sequence with well-developed stable isotope and magnetobiostratigraphy. Its first abundance peak at that site, just above the base of the Messinian Stage, corresponds with a major interglacial event recorded in the planktonic and benthic foraminiferal isotopic records, an episode believed to have produced significant melting of the continental ice sheet and the injection of low-salinity meltwaters across the surface of the southern ocean. (Auth. mod.)

E-50132

Prentice, M.L., et al, **Late Neogene antarctic glacial history: evidence from central Wright Valley**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.207-250, Refs. p.247-250.

As a test of the divergent hypotheses for Late Neogene antarctic climate and East Antarctic Ice Sheet behavior, the authors examined the surficial geology in central Wright Valley, a major ice-free valley cut into the seaward flank of the Transantarctic Mountains in the McMurdo Sound region. The four major climate episodes that are in evidence involve climates at least slightly warmer than at present and infrequent large-scale glaciation. The oldest deposit on the floor of Wright Valley is the Jason glaciomarine diamict. On the basis of marine diatoms and the $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of a shell fragment from the Jason glaciomarine deposit, it is suggested that a fjord occupied Wright Valley at 9 ± 1.5 Ma. From the negative $\delta^{18}\text{O}$ of the shell fragment, it is inferred that the Jason Fjord was both warmer and less saline than modern fjords in this region. Hence the Jason Fjord episode represents a warmer-than-present interval with reduced local ice extent. The authors propose a shallow fjord which implies that the local mountains were less than 400 m below their present elevation at 9 ± 1.5 Ma. Hence East Antarctic Ice Sheet expansions sufficient to invade and overdeepen Wright Valley prior to the Jason Fjord episode achieved at least present ice sheet dimensions. At 5.5 ± 0.4 Ma, Wright Valley was largely ice-free and occupied by a fjord in which were deposited the Prospect Mesa gravels. The presence of marine diatoms from the Antarctic Convergence and a thick-shelled pecten with negative $\delta^{18}\text{O}$ coupled with the absence of coccolithophores implies that fjord waters were 0-3 C. Because fjord influx derives from the Ross Sea, the sea level climate of the Ross Sea was at least slightly warmer than it is today. (Auth. mod.)

E-50133

Quilty, P.G., **Coastal East Antarctic Neogene sections and their contribution to the ice sheet evolution debate**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.251-264, Refs. p.262-264.

Several localities in coastal East Antarctica have yielded thin sediment sequences of Pliocene and younger ages. Marine Plain in the Vestfold Hills contains a 9 m-thick section of diatomite and sandstone from the interval 4.2-3.5 Ma. The locality is notable in containing abundant cetacean remains, including a new genus and species of dolphin and at least three other species of whale. No glacial debris has been found in these sediments, and some parameters suggest a water temperature of about 5 C. The East Antarctic ice sheet margin was inland of its present position, and the ice sheet was smaller. At Stornes Peninsula in the Larsemann Hills a small area contains a 40 cm-thick unit with well-preserved Pliocene benthic foraminifera. Diatoms indicate that this deposit

is 3 to 2 m.y. old. Sediments near Casey Station in the Windmill Is. have yielded diatom floras, mostly marine, but one lacustrine. These deposits formed 2-1 m.y.a. and lack diatom taxa typical of today's very cold coastal conditions. Reworked sediment in the base of an ice cliff north of Casey is much younger. In the Heidemann Valley in the Vestfold Hills, marine sediments contain diverse faunas and floras, including both planktonic and benthic foraminifera. Various dating techniques provide an age estimated at between 1 Ma and 300 ka. Oxygen isotope analysis suggests a water temperature slightly higher than that of today. (Auth. mod.)

E-50134

Domack, E.W., Mashiotto, T.A., Burkley, L.A., Ishman, S.E., **300-year cyclicity in organic matter preservation in antarctic fjord sediments**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.265-272, 18 refs.

Total organic carbon and biogenic silica analyses were conducted on samples from a 9 m-long piston core collected in Andvord Bay. Accelerator mass spectrometer radiocarbon analyses were conducted on organic matter fractions and foraminifers and resulted in an excellent chronology for the past 3000 years. Fluctuations in the preserved total organic and biogenic silica record approximately 12 cycles over the same time period. The cycles are the result of either temporal variations in the vertical carbon flux, as controlled by variable productivity, or changes in the terrigenous sediment supply, as controlled by variable meltwater input or variations in bottom sediment resuspension. Hence the complete 3000-year record of fluctuating total organic carbon and biogenic silica may record a unique signal of paleoclimatic and/or oceanographic changes for this portion of the Antarctic Peninsula. (Auth.)

E-50135

Siena, F., Coltorti, M., **Thermobarometric evolution and metasomatic processes of upper mantle in different tectonic settings: evidence from spinel peridotite xenoliths**, *European journal of mineralogy*, Nov.-Dec. 1993, 5(6), p.1073-1090, Refs. p.1088-1090.

Petrological studies of spinel peridotite xenoliths provide information on the nature and physico-chemical evolution of the upper mantle and its variability on a regional scale, in both oceanic and continental environments. The xenolith populations studied in this work—from Mt. Lessini and Sardinia (Italy), Mt. Melbourne (Antarctica), the Canary Is. and the Cape Verde Is.—on the whole define a variably depleted sequence which is residual after partial melting; they range from lherzolites to harzburgites (and minor dunites), showing a decreasing abundance of clinopyroxene and orthopyroxene, which is correlated with the Cr/Cr+Al ratio in coexisting spinels. Accordingly, the incompatible element abundances of unmetasomatized samples vary from 1-3 times chondritic in lherzolites to about 0.1 times chondritic in the most depleted harzburgites. Refractory lithologies characterize suboceanic mantle. Thermobarometric estimates based on phase equilibria and CO_2 inclusions indicate different pressure-temperature equilibration histories for xenoliths from different tectonic settings. (Auth. mod.)

E-50136

Wilson, P., Clark, R., McAdam, J.H., Cooper, E.A., **Soil erosion in the Falkland Islands: an assessment**, *Applied geography*, Oct. 1993, 13(4), p.329-352, Refs. p.350-352.

Observations and data concerning soil erosion on clay-rich, sand-rich and organic soil materials are reported for the Falkland Is. where soil erosion is both widespread and currently active, though rather uneven in its distribution. The most extensively eroded areas are located on coastal sand deposits and where sandy soils occur at inland sites. There is evidence that some erosion is natural and was initiated before the Islands were settled; other erosion is of more recent origin and can be associated with land management practices, principally grazing management, stocking rates, and the frequency and intensity of pasture burning. The impact of soil erosion on the agricultural economy of the Islands appears to be negligible and it is not perceived to be an important environmental issue. It is suggested that a research program be established aimed at

monitoring erosion rates, assessing land use practices that initiate erosion, and assessing the costs of erosion. Furthermore, guidelines for soil conservation should be established. (Auth. mod.)

E-50138

LeMasurier, W.E., Harwood, D.M., Rex, D.C., **Geology of Mount Murphy volcano: an 8-m.y. history of interaction between a rift volcano and the West Antarctic ice sheet**, *Geological Society of America. Bulletin*, Feb. 1994, 106(2), p.265-280, Refs. p.279-280.

Volcanic rocks, glaciogenic sediments and recycled marine microfossils at Mount Murphy provide evidence for large-scale fluctuations in the mass of the West Antarctic ice sheet during Neogene time. Mount Murphy is a large shield volcano with an atypical structure. Its basal unit consists of alternating subaquatic and subaerial rock types through a stratigraphic interval of at least 300 m, suggesting that ice level changed several times during shield building. Much larger changes are suggested by an outcrop of glacial lake sediment near the volcano summit, 1,300 m above present ice level. It contains an assemblage of recycled marine microfossils derived from marine basins in the interior of West Antarctica. They suggest multiple intervals of near-complete deglaciation in West Antarctica between about 24 and 3.5 Ma. It has long been suspected that the West Antarctic ice sheet is unstable and vulnerable to greenhouse warming, because it is grounded more than 1,000 m below sea level. Results provide field evidence consistent with that proposal. More than the West Antarctic ice sheet may be involved, however. The nature of the evidence and timing of events at Mount Murphy are similar to the record in East Antarctica, suggesting continent-wide synchronicity of the major glacial and interglacial intervals. This conflicts with interpretations of marine data, which suggest a shorter history for the West Antarctic ice sheet and a more stable history for the entire ice sheet. (Auth. mod.)

E-50145

Ditchfield, P.W., Marshall, J.D., Pirrie, D., **High latitude palaeotemperature variation: new data from the Tithonian to Eocene of James Ross Island, Antarctica**, *Palaeogeography, palaeoclimatology, palaeoecology*, Feb. 15, 1994, 107(1/2), p.79-101, 63 refs.

An oxygen stable isotope study of molluscan macrofossils from the Tithonian to the Eocene of the James Ross I. and Alexander I. areas was carried out in conjunction with careful petrographic, mineralogical and geochemical analyses to assess the state of fossil preservation. The Alexander I. samples all showed evidence of alteration whilst samples from James Ross I. were variably preserved. The isotopic composition of those samples which met the textural and chemical criteria for well-preserved primary skeletal carbonate material were then used to construct a record of high latitude marine water temperature variation. This record shows a marked cooling of palaeotemperatures from the late Jurassic to the Albian, a warming in recorded palaeotemperatures during the mid-Cretaceous and a gradual cooling from the mid-Cretaceous to the Eocene. The isotopic pattern parallels that from low latitude sites, suggesting that climatic change was global and that relatively uniform latitudinal palaeotemperature gradients may have been maintained during a time of greenhouse climate. Using the James Ross I. data to calculate probable polar temperatures over the adjacent antarctic continent, the authors show that cold temperate or sub-polar conditions would have been established during the Albian, late Maastrichtian and Eocene. (Auth.)

E-50152

Cummings, M.A., Tumeo, M.A., Tilsworth, T., **Effects of freeze/thaw cycles on hydrocarbon contaminants in the active layer**, International Cold Regions Engineering Specialty Conference, 7th, Edmonton, Alberta, Mar. 7-9, 1994. Proceedings. Edited by D.W. Smith and D.C. Sego. Cold regions engineering: "A global perspective", Montreal, Canadian Society for Civil Engineering, 1994, p.579-587, 20 refs.

As part of a study of the movement of hydrocarbon contaminants in ice and frozen soil, researchers are seeking to determine the effects of freeze/thaw cycles on the behavior of diesel fuel in the active layer. Diesel was chosen as the contaminant because of its widespread use and

importance as heating and engine fuel in the polar regions. Other physical processes governing movement in non-frozen porous media will be held constant in a carefully controlled environment in order to isolate and examine the effects of freezing and thawing on contaminant migration. Field studies in the Arctic and Antarctic (including Williams Field and McMurdo Station) will be used to corroborate lab studies. A review of relevant literature and experiment methodology will be presented at the conference along with slides and data from a January, 1994 Antarctica field study. (Auth.)

E-50175

Hochschild, V., Stäblien, G., Klenke, M., **Geomorphological mapping and investigation of the thawing dynamics at Potter Peninsula (King George Island)**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.2, Paris, European Space Agency, 1994, p.1203-1210, ESA SP-361, 16 refs.

The geomorphology of Potter Peninsula at the southwestern edge of King George I. is defined by the climatological conditions of the maritime Antarctic. The forms consist of the perimarine, structural, cryogenic, glacial and fluvial units. The outwash plains with the basal moraines in front of the ice sheet occupy the largest areas. They are underlain by a fossil ice layer. The near surface soil temperatures show a clearly day/night change due to the geographical position above the polar circle. The active layer is 62 to >130 cm thick. As to soil types, one can find Antarctic Braunerde as well as solifluction nappe. Large areas are covered by tundra vegetation of lichens and mosses. With ERS-1 radar data and other optical remote sensing data the OEA Research Program tested how typical geomorphological mapping units are recognized according to the radar signal influencing parameters like surface roughness and soil moisture. (Auth.)

E-50184

Aleksashin, N.D., Laiba, A.A., **Stratigraphy and lithofacial features of Permian sedimentary sequence of Beaver Lake western coast** [Stratigrafiia i litologo-fatsial'nye osobennosti permskikh otlozhenii zapadnogo berega oz. Biver (gory Prins-Charl'z, Vostochnaia Antarktida)], *Antarktika*, 1993, No.31, p.43-51, In Russian with English summary. 9 refs.

The coal-bearing rocks outcropped on the western coast of Beaver Lake are believed to build a previously unknown stratigraphic unit about 1000 m thick. This newly determined unit was named 'Beaver Formation' and consists mostly of arkosic and potassic feldspar-quartzitic sandstones with minor mica-clayish and coaly siltstones, clay stones and coals. The sequence of interbedded rocks shows cyclic character. The authors divide the Beaver Formation into two subformations: the lower less coal-bearing (700 m), and the upper more coal-bearing, (300 m). The Beaver Formation contains 37 coal beds, 20 of which are more than 0.7 m thick, some beds being 5-8 m thick. Most coal beds were found inside the upper subformation where coal made up not less than 15% of the strata. The Permian age of these rocks follows from fossil botanical and palynological studies. The lowermost beds of the Beaver Formation have a tectonic contact with the upper part of the Bainmedart Formation in the southern part of the Beaver Lake west coast. A modified stratigraphic scheme of the Permian sedimentary sequence in the Beaver Lake area has been proposed. The bulk of the strata is divided into 4 formations (from bottom to top): the conglomeratic Radok f. (220 m); coal-bearing sandy Bainmedart (900 m); the Beaver (1000 m) formations and coal-free sandy Flegston F. (200-400 m). The field cross-sections of the Beaver Formation are described; petrographic, chemical and fossil botanical data are given; and the paleoenvironment of coal-bearing sequence is discussed. (Auth.)

E-50185

Laiba, A.A., Aleksashin, N.D., Mel'nik, A.IU., **Peridotites and serpentinites in northern Prince Charles Mountains** [Peridotity i serpentinity v severnoi chasti gor Prins-Charl'z (Vostochnaia Antarktida)], *Antarktika*, 1993, No.31, p.52-58, In Russian with English summary. 6 refs.

Two types of ultrabasic rocks, described for the first time in the northern part of the Prince Charles Mts. during the 1985-1989 field season are discussed: apoperidotitic (?) serpentinites, and spinel-bearing

peridotites (pyroxenites). The country rocks are represented by gneisses and schists of the Archaen Reinbolt and Larsemann Series. At the McLeod Massif the outcrops of serpentinites are controlled by intersected fault zones. The visible dimensions of the outcrops reach 250 x 700 m. The serpentinites are cut by mica- prehnitic veins. Determinations by the Pb-Th method yield ages from 1 330 to 2,040 m.y. for these veins, and show the serpentinites to be pre-Late Proterozoic in age. Petrographic and petrochemical data suggest primary harzburgite composition of the serpentinites. Large fragments of serpentinites were found as well at Mt. Kizaki, 75 km west of McLeod Massif. Spinel-bearing ultrabasites were studied at Jetty Peninsula and Geologov Massif. The bodies have stock- or dyke-like shapes with dimensions from 10 x 10 to 15 x 50 m. The cores of the bodies generally consist of lherzolites. The periphery zones consist of pyroxenites and amphibolized pyroxenites. The rocks contain increased amounts of green spinel. It seems likely for apoperidotitic (?) serpentinites and spinel-bearing ultrabasites to be both genetically and chronologically related to each other. Similar ultrabasites are known among granulites in Enderby Land and Queen Maud Land, where they are classified as high-Mg schists. (Auth.)

E-50186

Andronikov, A. V., **Clinopyroxenes from alkaline-ultrabasic rocks of Jetty Peninsula** [Klinopirokseny iz shchelochno-ul'traosnovnykh porod oazisa Dzhetti (gory Prins- Charl'z, Vostochnaia Antarktida)], *Antarktika*, 1993, No.31, p.59-63, In Russian with English summary. 6 refs.

The composition of clinopyroxenes from Early Cretaceous (120-145 Ma) alkaline- ultrabasic rocks (alkaline picrites and ultrabasic foidites) of the northern Prince Charles Mts. is discussed. Three types of rock-forming minerals for alkaline ultrabasites are distinguished. The earliest and of highest-temperature (930-1200 C) arise from the assimilation of essentially quartz xenoliths of crustal rocks by alkaline-ultrabasic melt. Microlites of diopside-salites from the bulk of alkaline picrites were crystallized at a high rate. These minerals have a zonation expressed in insignificant changes in their composition from core parts (diopside) to edges (salite). The temperature of crystallization of the central parts of the microlites is 755-835 C; those on the edge, 675-690 C. The rate of crystallization of pyroxenes from alkaline picrites was high and the lowering of the temperature was very rapid. Phenocrysts of diopside from ultrabasic foidites were formed by fractional crystallization in the intermediate magmatic source at a temperature of 780- 800 C. The pyroxenes of the bulk were crystallized at 650-670 C under conditions close to equilibrium, and correspond to salites in composition. (Auth.)

E-50189

Bardin, V.I., Shmideberg, N.A., **Hydrochemistry of lakes in the mountains of East Antarctica** [Gidrokhimicheskie issledovaniia ozer gornykh oazisov Vostochnoi Antarktidi], *Antarktika*, 1993, No.31, p.99-108, In Russian with English summary. 22 refs.

Data on the chemical composition of lake waters from the mountains of Coats Land and Mac. Robertson Land are presented. Comparative analyses of chemical composition of lake water and snow and glacier meltwater show a great variability in natural water composition in different areas of Antarctica and at different distances from the coast. The distribution of lake waters in the mountains of East Antarctica is systematized on the basis of the degree of mineralization and the hydrochemical types. (Auth. mod.)

E-50203

Burckle, L.H., **Is there direct evidence for late Quaternary collapse of the West Antarctic ice sheet**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.491-494, 22 refs.

By studying diatoms recovered from sediment taken from beneath the West Antarctica ice sheet (Ice Stream B), Scherer (1991) concluded that this feature must have collapsed at least once during the past 600 kyear and that the two likely candidates for time of collapse were oxygen-isotope stage 11 (362-423 kyear BP) and sub-stage 5e (110-128 kyear BP). This conclusion does not stand up to critical examination of the data, however. Specifically, the diatom datum level, the last occurrence of *Actinocyclus ingens*, used to constrain the 600 kyear date is diachronous into higher latitudes and does not apply in sediments recovered

from near Antarctica. Secondly, the additional diatoms used to constrain the time of collapse to the late Quaternary either range before the late Quaternary or have no published geological record. In spite of this, there are data to suggest that one or more late Quaternary interglacial intervals were as warm as, or warmer than, the present. As yet, however, no direct evidence exists to incorporate a West Antarctic ice sheet collapse into these scenarios. It is suggested that this debate would be best resolved by study of deep-sea sediments of late Quaternary age recovered from around the Antarctic continent. (Auth.)

E-50217

Scherer, R., **There is direct evidence for Pleistocene collapse of the West Antarctic ice sheet**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.716-722, 37 refs.

The author examines evidence for late Pleistocene collapse of the West Antarctic ice sheet as inferred from the age determination of diatom fossils recovered in glacial deposits beneath Ice Stream B; discusses alternative interpretations of the provenance, transport and dating of such sediments; amplifies the ambiguities in distinguishing late Pleistocene deposits from Pliocene diatoms, and concludes that the evidence is consistent with late Pleistocene collapse.

E-50222

Mazzullo, E.K., ed, Stewart, N.J., ed, , **Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay**, College Station, Texas A and M University, 1991, 1003p., Refs. passim. For individual papers see B-50256 through B-50259, E-50223 through E-50226, E-50228 through E-50255, E-50261 through E-50264, E-50266 through E-50275, F-50227, J-50260 and L-50265.

DLC QE39.T49b

Vol.119 presents results from the Ocean Drilling Program (ODP), where scientists used a specially equipped ocean drilling ship to sample and measure the properties of the submerged part of the Earth's crust. These data are then synthesized with other information to yield new insights into earth processes. Fifty three papers are presented, grouped into the following sections: Prydz Bay stratigraphy and sedimentology, Kerguelen Plateau sedimentology, logging, igneous studies, geochemistry, paleontology, biology, isotopes, chemostratigraphy and paleomagnetism, and syntheses. A section in the back of the volume called Data Reports consists of good data that are not ready for final interpretation.

E-50223

Cooper, A., Stagg, H., Geist, E., **Seismic stratigraphy and structure of Prydz Bay, Antarctica: implications from Leg 119 drilling**, *Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay*, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.5-25, Refs. p.22-23.

DLC QE39.T49b

New and reprocessed seismic reflection data are combined with drilling results from 5 Leg 119 sites across Prydz Bay to study the regional stratigraphy and structure of the continental shelf and upper slope. Severe seismic multiples hamper interpretations, yet 7 acoustic units separated by unconformities can be distinguished regionally. Only 4 units (sedimentary) have been drilled. More than 5 km of well- to poorly-stratified units beneath the inner shelf fill the northeast-trending Prydz Bay basin, which is related to, but separated from, the Lambert Graben. Basinal units overlie metamorphic basement and are continental nonmarine deposits of possible Late Paleozoic to Early Mesozoic age. Seaward, the basin is flanked by a buried and intruded(?) basement ridge. Continuous to distorted reflections cover the ridge and dip seaward in a prograding unit beneath the outer shelf. A flat-lying unit of chaotic to continuous reflectors directly beneath the seafloor covers most of the northeast shelf and is composed of compacted glacial diamictites of Late Miocene and younger age. It is suggested that significant rifting and glacial events have caused acoustic discontinuities beneath Prydz Bay. The principal rifting events began with earliest rifting of Gondwana in Late Paleozoic time and culminated with continental breakup in Early Cretaceous time. The advent of East Antarctic glaciation in Late Eocene to Early Oligocene time and the grounding of ice sheets across the shelf in Mid- and Late-Cenozoic times created the principal glacial disconfor-

mities. The seaward-prograding glacial sequences beneath the outermost shelf record numerous post-early Oligocene glacial events and likely sea-level changes that can only be partially mapped with existing seismic and drilling data. (Auth. mod.)

E-50224

Cochrane, G.R., Cooper, A.K., **Sonobuoy seismic studies at ODP drill sites in Prydz Bay, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.27-43, 11 refs.

DLC QE39.T49b

Five sonobuoy seismic-refraction records were collected along the Leg 119 geophysical transect across the Prydz Bay shelf. Velocity-depth profiles are computed from the sonobuoy data and are used to produce a depth section for the principal acoustic unit boundaries observed in the seismic-reflection data along the transect. Travel time curves generated by ray-tracing for models constructed from downhole velocity logs are compared to curves generated for models based solely on the sonobuoy data. This comparison reveals that sonobuoy data are less reliable for analysis of lithostratigraphy in vertically and laterally complex areas; however, the sonobuoy data can be used to accurately estimate the depth to a specific horizon in the reflection data to within 10 m. Near-surface velocities exceed 2.0 km/s at all sites, indicating likely overconsolidation of sediments due to glacial loading and erosion during periods of grounded ice sheets on the shelf. Sedimentary rock velocities exclusively were observed beneath the shelf to depths of 3 km. At the landward site a deep refraction is observed with a velocity and vertical gradient indicative of basement rock. (Auth.)

E-50225

Turner, B.R., **Depositional environment and petrography of preglacial continental sediments from Hole 740A, Prydz Bay, East Antarctica**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.45-56, 27 refs.

DLC QE39.T49b

ODP Hole 740A is located on the inner part of the east antarctic continental shelf in Prydz Bay, at the seaward end of a major onshore rift structure known as the Lambert Graben. Drilling at this site led to the recovery of some 65 m of continental sediments (Prydz Bay and red beds) that form part of a much thicker (2-3 km) pre-continental breakup sequence, the development of which may be related to the initiation and rifting of the Lambert Graben. Palynological and paleomagnetic studies have not been able to determine the age of the sediments; they may be equivalent to the onshore late Permian Amery Group or younger. The succession consists predominantly of sandstone, siltstone, and claystone arranged in erosively based, pedogenically influenced fining-upward sequences up to 5 m thick. These were deposited by shallow braided streams draining an extensively vegetated alluvial plain, with sufficient topographic relief to trap fine-grained sediment and inhibit rapid channel shifting. Differences in mineralogical composition between the Amery Group and the Prydz Bay red beds probably reflect differences in rock composition in the source area. The age of the Prydz Bay red beds has still to be resolved. (Auth. mod.)

E-50226

Turner, B.R., Padley, D., **Lower Cretaceous coal-bearing sediments from Prydz Bay, East Antarctica**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.57-60, 13 refs.

DLC QE39.T49b

Drilling in the inner part of Prydz Bay (ODP Leg 119, Site 741) revealed the presence of a 100 m-thick sequence of Lower Cretaceous coal-bearing sediments, buried beneath some 24 m of glacial debris. The sediments contain spores and pollen indicating an Early Cretaceous (middle Albian) age. Seismic evidence suggests that these sediments form part of a 2-3 km-thick subhorizontal sedimentary sequence that

probably overlies Precambrian basement. A major angular unconformity occurs within this thick sedimentary sequence on some seismic lines, with the older sediments predating continental breakup and the younger sediments, including the Lower Cretaceous coal-bearing sediments, postdating breakup. The breakup has been dated as Early Neocomian (130 Ma) on the basis of the M10- M11 magnetic anomalies reported by Powell et al. (1988).

E-50228

Hambrey, M.J., Ehrmann, W.U., Larsen, B., **Cenozoic glacial record of the Prydz Bay continental shelf, East Antarctica**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.77-132, Refs. p.122-125.

DLC QE39.T49b

Drilling was undertaken at five sites (739-743) on ODP Leg 119 on a transect across the continental shelf of Prydz Bay to elucidate the long-term glacial history of the area and to examine the importance of the area with respect to the development of the east antarctic ice sheet as a whole. In addition to providing a record of glaciation spanning 36 m.y. or more, Leg 119 has provided information on the development of a continental margin under the prolonged influence of a major ice sheet. This has allowed the development of a sedimentary model that may be applicable not only to other parts of the antarctic continental margin, but also to northern high-latitude continental shelves. The cored glacial sedimentary record in Prydz Bay consists of three major sequences, dominated by diamictite. (Auth. mod.)

E-50229

Jenkins, C.J., Alibert, C., **Sedimentary and metamorphic rock clasts from the Cenozoic diamictites of Sites 739-743, Prydz Bay, East Antarctica**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.133-141, 16 refs.

DLC QE39.T49b

Petrographic studies of clasts in the glacial diamictites of Prydz Bay indicate that the predominant ice supply was from the Lambert Glacier (Prince Charles Mountains and Lambert Graben regions); no compelling evidence is seen for clastic supply from the Vestfold Hills or Larsemann Hills areas. The clasts also reveal the presence in East Antarctica of an early Oligocene-late Eocene (34-36 Ma) diatomaceous marine marl facies and a Jurassic-Cretaceous sandy limestone lithofacies, possibly of subaerial origin. (Auth.)

E-50230

Solheim, A., Forsberg, C.F., Pittenger, A., **Geotechnical properties of glacial shelf sediments from Prydz Bay, East Antarctica**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.143-167, Refs. p.158-159.

DLC QE39.T49b

This paper presents a geotechnical characterization of the glacial sediments in Prydz Bay based on shipboard physical properties data obtained during Leg 119, combined with results of land-based analyses of 24 whole-round core samples. Main emphasis is placed on the land-based studies, which included oedometer consolidation tests, triaxial and simple shear tests for undrained shear strength, permeability tests in oedometer and triaxial cell, Atterberg limits, and grain-size analyses. The bulk of the tested sediments comprise overconsolidated diamictites of a relatively uniform lithology. The overconsolidation results from a combination of glacial loading and sediment overburden subsequently removed by extensive glacial erosion of the shelf. This leads to down-hole profiles of physical properties that have been observed not to change as a function of the thickness of present overburden. A number of fluctuations in the parameters show a relatively systematic trend which most likely results from changes in the proximity to the ice sheet grounding line in response to variations in the glacial regime. Very low permeabilities mainly result from high preconsolidation stresses (P_c'). P_c' values up to 10,000 kPa were estimated from the oedometer tests, and

empirical estimates based on undrained shear strengths (up to 2500 kPa) indicate that the oedometer results are conservative. The diamictites generally classify as inactive, of low to medium plasticity, and they consolidate with little deformation, even when subjected to high stresses. (Auth.)

E-50231

Solheim, A., Forsberg, C.F., Pittenger, A., **Stepwise consolidation of glacial sediments related to the glacial history of Prydz Bay, East Antarctica**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.169-182, Refs. p.181-182.

DLC QE39.T49b

A series of samples from the five sites drilled across the continental shelf and upper slope in Prydz bay during ODP Leg 119 were consolidation tested in an oedometer. Preconsolidation stresses increase down-core at Sites 739 and 742 in a stepwise manner, and the steps are interpreted to represent periods of increased action of grounded glaciers covering the entire shelf. Sediment loading and subsequent erosion seem to be the most important factor for increasing the overconsolidation ratios, and a total glacial erosion exceeding 1 km is possible. Four separate steps in consolidation, here termed "load events", have been identified. The lowermost load event, 1, is correlated to the onset of glaciations reaching the shelf edge and an early period of extensive glaciations, starting in Early Oligocene or possibly earlier. Glacial activity related to the buildup of ice in West Antarctica in the Late Miocene is tentatively correlated to load event 2. Event 3 is the trace of relatively extensive glacial erosion probably in the Pliocene, whereas the upper step in preconsolidation stress, load event 4, results from the last glaciation reaching the shelf edge, possibly during the Late Weichselian. (Auth. mod.)

E-50232

Ehrmann, W.U., **Implications of sediment composition on the southern Kerguelen Plateau for paleoclimate and depositional environment**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.185-210, Refs. p.202-203.

DLC QE39.T49b

Cretaceous to Quaternary sediments recovered on the southern tip of the Kerguelen Plateau were studied in order to determine the depositional environment and the paleoceanography of the southern Indian Ocean and especially the long-term glacial history of East Antarctica. Emphasis is given to bulk-sediment composition, grain-size data, and clay mineralogy. The first indication of glaciation at sea level is the occurrence of isolated gravel and terrigenous sand grains, which indicate ice rafting in the Middle Eocene interval of 45.0-42.3 Ma. A major intensification of glaciation, probably the onset of continental East Antarctic glaciation, is recorded in sediments of Early Oligocene age (36.0 Ma). All major sediment parameters document this event. The clay mineralogy changes from smectite-dominated assemblages to illite- and chlorite-dominated assemblages, indicative of cooler climates and physical weathering. Ice-rafted debris of both gravel and sand size occurs in large quantities in that interval and coincides with a change in the mode of carbonate deposition. Carbonate contents are relatively high and uniform (90-95%) in strata younger than Early Oligocene; in Oligocene to Upper Miocene strata they fluctuate between 65 and 95%. Oligocene and Neogene hiatuses reflect an intensification of oceanic circulation and the increased erosional force of Circumpolar Deep Water. The long-term Cenozoic cooling trend was interrupted by a phase of Early Miocene warming indicated by maximum Neogene smectite concentrations. (Auth. mod.)

E-50233

Bohrmann, G., Ehrmann, W.U., **Analysis of sedimentary facies using bulk mineralogical characteristics of Cretaceous to Quaternary sediments from the Kerguelen Plateau: Sites 737, 738, and 744**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and

M University, 1991, p.211-223, Refs. p.219-220.

DLC QE39.T49b

Carbonate is the dominant component in the pelagic sediments on the Kerguelen Plateau. In addition, biogenic opal sedimentation plays an important role throughout most of the sequence. A major increase in opal accumulation is documented at all sites in Late Miocene time, which is in accordance with the well-known increase in silica productivity probably caused by a major cooling step. Because of their position near the Polar Frontal Zone, sediments from Site 737 show a more extensive opal deposition than at Sites 744 and 738. An earlier productivity pulse is documented at Site 744 on the southern plateau within the Early Oligocene, following the initial phase of intense East Antarctic glaciation. This cooling event resulted in higher amounts of ice-rafted terrigenous quartz and, to a lesser extent, feldspar. With the exception of the Site 744 sediments, opal deposition in Paleogene and older sediments can be reconstructed only from the diagenetic transformation products of opal-CT and probably clinoptilolite. In contrast to the southern sequence, on the northern Kerguelen Plateau higher amounts of clinoptilolite but no opal-CT were found. These major differences in the diagenetic environments may be due to extensive volcanism in the northern area. The volcanic influence at Site 737 is well recorded by the higher feldspar content and greater amounts of volcanic glass shards. (Auth. mod.)

E-50234

Ehrmann, W.U., Grobe, H., **Cyclic sedimentation at Sites 745 and 746**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.225-237, Refs. p.234-235.

DLC QE39.T49b

The Upper Miocene to Pleistocene sediments recovered at ODP Sites 745 and 746 in the Australian-Antarctic Basin are characterized by cyclic facies changes. Sedimentological investigations of a detailed Quaternary section reveal that facies A is dominated by a high content of siliceous microfossils, a relatively low terrigenous sediment content, an ice-rafted component, low concentrations of fine sediment particles, and a relatively high smectite content. This facies corresponds to interglacial sedimentary conditions. Facies B, in contrast, is characteristic of glacial conditions and is dominated by a large amount of terrigenous material and a smaller opaline component. There is also a prominent ice-rafted component. The microfossils commonly are reworked and broken. The clay mineral assemblages show higher proportions of glacially derived illite and chlorite. A combination of 4 different processes, attributed to glacial-interglacial cycles, was responsible for the cyclic facies changes during Quaternary time: transport by gravity, ice, and current, and changes in primary productivity. Of great importance was the movement of the grounding line of the ice shelves, which directly influenced the intensity of ice rafting and of gravitational sediment transport to the deep sea. The extension of the ice shelves was also responsible for the generation of cold and erosive Antarctic Bottom Water, which controlled the grain-size distribution, particularly of the fine fraction, in the investigated area. (Auth.)

E-50235

Ehrmann, W.U., Grobe, H., Fütterer, D.K., **Late Miocene to Holocene glacial history of East Antarctica revealed by sediments from Sites 745 and 746**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.239-260, Refs. p.250-251.

DLC QE39.T49b

The sediments recovered at ODP Sites 745 and 746 in the Australian-Antarctic Basin are characterized by cyclic facies changes between clayey diatom oozes and diatomaceous clays ranging in age from Late Miocene (about 10 Ma) to Quaternary. The gravel and terrigenous sand content of the sediments is used as an indicator of the intensity of ice rafting through time. Maxima are recorded at 8.7-7.9, 6.6-6.0, 5.0-4.4, and 4.0-3.2 Ma. The maxima in more recent times are much less pronounced and occur at 2.4-1.6 and 1.4-1.0 Ma. All sand- and gravel-sized terrigenous sediment particles are of gneissic or granitic origin and originated

from the east antarctic continent. The maxima of ice rafting recorded at Sites 745 and 746 do not appear to represent local phenomena. Rather they document major advances and decays of the antarctic ice shelves and glaciers and therefore represent events of great importance for the reconstruction of the paleoceanography of the southern ocean and the glacial history of Antarctica. In general, ice rafting was pronounced in the Late Miocene and Early Pliocene epochs, which are characterized by repeated ice advances and retreats. Ice rafting was less intensive during the Late Pliocene to Quaternary time period, when ice shelves remained relative stable. (Auth. mod.)

E-50236

Ollier, G., Mathis, B., **Lithologic interpretation from geophysical logs in Holes 737B, 738C, 739C, and 742A**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.263-289, Refs. p.288-289.

DLC QE39.T49b

In the Kerguelen Plateau holes the radioactivity and uranium, thorium, and potassium logs were used to determine the amount and the nature of clays. Holes 737B and 738C are located on the northern and southern Kerguelen Plateau, respectively, whereas Holes 739C and 742A are located on the antarctic shelf in the Prydz Bay area. Six logging units are recognized in Hole 737B in the depth interval 296.5-701.0 m below seafloor (mbsf) and 3 in Hole 738C in the depth interval 113.0-455.0 mbsf on the basis of the shaliness and the porosity of the calcareous formations. Almost no clay was found from the logs in Hole 738C, whereas a significant amount of illite and montmorillonite, up to 38.5% of the dry bulk, was found in Hole 737B. The deposits in the holes of the antarctic shelf show a very high radioactivity rate (up to 120 GAPI in Hole 742A) due to the presence of granitic eroded basement rocks. Two kinds of glacial sediments were identified from the log records in Hole 742A and 739C. The first corresponds to compacted massive diamictite units deposited beneath grounded ice; the second kind corresponds to less compacted stratified diamictite units deposited seaward of the grounding line. The basal glacier deposits are compacted because the weight of the ice has acted upon the sediments since the time of their deposit, whereas distal diamictites are less affected by ice loading. In both Holes 739C and 742A, the alternation of basal diamictites and distal diamictites suggests several cycles of ice advance and retreat. At least two cycles seem to have occurred from the Pliocene to the present. (Auth. mod.)

E-50237

Alibert, C., **Mineralogy and geochemistry of a basalt from Site 738: implications for the tectonic history of the southernmost part of the Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.293-298, Refs. p.296-297.

DLC QE39.T49b

The Lower Cretaceous tholeiitic basalt cored at Site 738 on the southernmost part of the Kerguelen Plateau shows anomalous Sr, Nd, and Pb isotopic compositions compared to other lavas from the Kerguelen Is. and the Kerguelen Plateau. The strongly negative value of epsilon Nd (-8.5) and high $^{207}\text{Pb}/^{204}\text{Pb}$ ratio (15.71) reflect a long-term evolution in a source high in Nd/Sm. These geochemical properties, not observed in the Indian Ocean mantle plumes (St. Paul, Kerguelen Is.), have been reported for alkali lavas erupted in East Antarctica, thus suggesting that they originate from the Gondwana subcontinental lithosphere. (Auth.)

E-50238

Mehl, K.W., Bitschene, P.R., Schmincke, H.U., Hertogen, J., **Composition, alteration and origin of the basement lavas and volcanoclastic rocks at Site 738, southern Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M Uni-

versity, 1991, p.299-321, Refs. p.320-321.

DLC QE39.T49b

During ODP Leg 119 one basement hole was drilled at Site 738, on the southern Kerguelen Plateau. The 38.2 m of basement rocks drilled comprises three basaltic aa-lava flows with basal and top breccias, overlain by Turonian marine carbonates. Site 738 basalts probably erupted near a fracture zone, and were emplaced during the plateau-forming stage of Kerguelen Plateau evolution under quiet subaerial to shallow water conditions. The basalts are T-MORB, chemically resembling Mesozoic continental flood basalts of the Southern Hemisphere. Two slightly different magma batches are distinguished by Fe, Ti, Al, Zr, and REE concentrations. Prior to eruption, the magmas had undergone significant olivine and some clinopyroxene fractionation. A saponite-celadonite secondary mineral assemblage confines the alteration temperature to <170 C. Alteration is accompanied by net gains of H_2O , CO_2 , K_2O , and Rb, higher oxidation, minor Na_2O , SiO_2 gains, and losses of V and CaO. Released Ca, together with Ca from seawater, precipitated as calcite in veins and vesicles, plumbed the circulation system and terminated the rock/open seawater interaction. (Auth. mod.)

E-50239

Morche, W., Hubberten, H.W., Ehrmann, W.U., Keller, J., **Geochemical investigations of volcanic ash layers from Leg 119, Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.323-344, Refs. p.333-334.

DLC QE39.T49b

Geochemical investigations were carried out on 19 discrete ash layers and on 42 dispersed ash accumulations in Oligocene to Pleistocene sediments from Sites 736, 737, 745, and 746 of ODP Leg 119 (Kerguelen Plateau). The chemical data obtained from more than 500 single-grain glass analyses allow the characterization of two dominant petrographic rock series. The first consists of transitional- to alkali-basalts, the second mainly of trachytes with subordinated alkali-rhyolites and rhyolites. Chemical correlation with possible source areas indicates that the tephra layers from the northern Kerguelen Plateau Sites 736 and 737 were probably erupted from the nearby Kerguelen Is. The investigated ash layers clearly reflect the Oligocene to recent changes in the composition of the volcanic material recorded from the Kerguelen Is. The dispersed ashes from Sites 745 and 746 in the Australian-Antarctic Basin display almost the same range in chemical compositions as those from the north. Heard I. and other sources may have contributed to their formation, in addition to the Kerguelen Is. (Auth. mod.)

E-50240

Chambers, S.R., Cranston, R.E., **Interstitial-water geochemistry of Kerguelen Plateau sediments**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.347-374, Refs. p.373-374.

DLC QE39.T49b

This report synthesizes all of the interstitial-water chemistry studies associated with the Kerguelen Plateau phase of ODP Leg 119. Sediments were cored at six sites in water depths ranging from 564 to 4082 m. A total of 77 interstitial-water samples were recovered as part of the routine sampling protocol. In addition, a novel high-resolution pore-water sampling program was tested during Leg 119 that enabled the authors to pinpoint reaction zones and extend their data base to deeper, drier levels that were heretofore inaccessible. Data collected include interstitial-water sodium, potassium, calcium, magnesium, pH, alkalinity, sulfate, ammonia, phosphate, aqueous silica, salinity, chloride, oxidation-reduction potentials, and sediment chemistry. The northern sector (Sites 736 and 737) is characterized by the highest sedimentation rates (up to 140 m/m.y.) and thermal gradients (70-98 C/km) encountered on the Kerguelen Plateau during Leg 119. The southern portion of the Kerguelen Plateau (Sites 738 and 744) records the lowest sedimentation rates (less than 5 m/m.y.) and thermal gradients (43 C/km) of the three study areas. Sediment-accumulation rates on the Eastern Kerguelen Sed-

iment Ridge (Sites 745 and 746) are intermediate to those of the northern and southern sites. Deposition below the regional CCD accounts for the nearly carbonate-free siliceous sediments. (Auth. mod.)

E-50241

Chambers, S.R., **Solute distributions and stable isotope chemistry of interstitial waters from Prydz Bay, Antarctica**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.375-392, Refs. p.391-392.

DLC QE39.T49b

Leg 119 of the Ocean Drilling Program (ODP) provided the first opportunity to study the interstitial-water chemistry of the eastern antarctic continental margin. Five sites were cored in a northwest-southeast transect of Prydz Bay that extended from the top of the continental slope to within 30 km of the coastline. Geological studies of the cores reveal a continental margin that has evolved through terrestrial, glacial, and glacial-marine environments. Chemical and stable isotopic analyses of the interstitial waters were performed to determine the types of depositional environments and the diagenetic and hydrologic processes that are operating in this unusual marine environment. Highly compacted glacial sediments provide an effective barrier to the vertical diffusion of interstitial-water solutes. Meteoric water from the antarctic continent appears to be flowing into Prydz Bay sediments through the sequence of terrestrial sediments that lie underneath the glacial sediments. The large amounts of erosion associated with glacial advances appear to have had the effect of limiting the amount of marine organic matter that is incorporated into the sediments on the continental shelf. Although all of the sites cored in Prydz Bay exhibit depletions in dissolved sulfate with increasing depth, the greatest bacterial activity is associated with a thin layer of diatom ooze that coats the seafloor of the inner bay. (Auth. mod.)

E-50242

Cranston, R.E., **Testing a higher resolution interstitial-water method for the Ocean Drilling Program**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.393-399, 7 refs.

DLC QE39.T49b

Ocean Drilling Program inorganic geochemistry procedures routinely overlook more than 99% of the sediment column. Present and past biogeochemical reactions alter the sediment record; however, most of these reaction zones are bypassed by the normal methods where samples are collected every 30 m. A new approach to increase resolution was introduced during Leg 119. Ten milliliters of sediment provided interstitial-water samples for ammonia, silica, sulfate, magnesium, and calcium analyses. The new method introduced some systematic differences in concentrations, as well as some decrease in precision. A number of advantages, however, may warrant using the method in some instances. In cases where routine interstitial-water data showed anomalous results, core sections were retrieved from the storage facility and resampled. The new high-resolution procedure was used to provide water samples in cases where water contents were low and routine squeezing could not recover pore water. (Auth.)

E-50243

Cranston, R.E., **Sedimentation rate estimates from sulfate and ammonia gradients**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.401-405, 24 refs.

DLC QE39.T49b

Data from the Ocean Drilling Program and from other marine studies are used to relate organic carbon flux preserved in the seabed with the uptake of sulfate and production of ammonia in the pore water of the sediment column. Relationships are derived that can be used to estimate recent sedimentation rates to within one order of magnitude, spanning the range from 0.1 to 100,000 m/m.y. The relationships provide a simple rule of thumb to apply to initial observations when an estimate of sedi-

mentation rate is not readily available from biostratigraphic or isotope methods. The sedimentation rates estimated for the Leg 119 sites agree to within a factor of 3 with the biostratigraphic results. (Auth.)

E-50244

McDonald, T.J., Kennicutt, M.C., II, Rafalska, J.K., Fox, R.G., **Source and maturity of organic matter in glacial and Cretaceous sediments from Prydz Bay, Antarctica, ODP Holes 739C and 741A**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.407-416, 16 refs.

DLC QE39.T49b

Organic matter in Miocene glacial sediments in Hole 739C on the antarctic shelf represents erosional recycled continental material. Various indications of maturity in bulk organic matter, kerogens, and extracts imply that an exposed section of mature organic carbon-rich material was present during the Miocene. Based on biomarker, *n*-alkane, and kerogen analysis, a massive diamictite of early Eocene/Oligocene age at Hole 739C was found to contain immature organic matter. Visual and pyrolysis analyses of the kerogens suggest a predominance of terrestrial organic matter in all samples from Hole 739C. A reversal of thermal maturities, i.e., more-mature overlying less-mature sections, may be related to redeposition generated from glacial erosion. Siliciclastic fluvial sediments of Lower Cretaceous age from Hole 741A were analyzed. The organic matter from this hole contains immature aliphatic and aromatic biomarkers as well as a suite of odd carbon number-dominated *n*-alkanes. Visual examination and pyrolysis analysis of the kerogen suggests that predominantly immature terrestrial organic matter is present at Hole 741A. The similarities between Hole 739C Unit V and Hole 741A suggest that the source of the organic matter in the glacial sediments in Unit V at Hole 739C could be Cretaceous in age and similar to sediments sampled at Hole 741A in Prydz Bay. (Auth.)

E-50245

Kvenvolden, K.A., Hostettler, F.D., Rapp, J.B., Frank, T.J., **Aliphatic hydrocarbons in sediments from Prydz Bay, Antarctica**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.417-424, 20 refs.

DLC QE39.T49b

High molecular weight aliphatic hydrocarbons were extracted from sediments at two sites (741 and 742) drilled during ODP Leg 119 in Prydz Bay. The distributions of *n*-alkanes and triterpenoid and steroid hydrocarbons suggest that the *n*-alkanes and steranes are mainly of terrestrial origin and that the hydrocarbons are immature to slightly mature in the Lower Cretaceous sediments and immature to mature in the Tertiary sediments. At Site 741, the Lower Cretaceous depositional sequence, which is generally characterized by immature hydrocarbons, is interrupted by sediment having more mature components, suggesting a change of source during part of Early Cretaceous time. At Site 742, the mature geochemical parameters of a Pliocene sample correlate with results reported elsewhere for Site 739. In all but one of the other Tertiary samples, the geochemical parameters indicate intermediate maturity. The Lower Cretaceous and Pliocene sediments average about 1.9% organic carbon, a value of interest from the point of view of potential sources of petroleum offshore of Antarctica. (Auth.)

E-50246

Huber, B.T., **Paleogene and Early Neogene planktonic foraminifer biostratigraphy of Sites 738 and 744, Kerguelen Plateau (southern Indian Ocean)**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.427-449, Refs. p.441-442.

DLC QE39.T49b

A virtually complete composite history of Cenozoic pelagic sedimentation was recovered from ODP Sites 738 and 744 drilled during Leg 119 on the Kerguelen Plateau. An excellent magnetobiochronologic

record was obtained from upper Eocene through Holocene sediments at Site 744, and an expanded lower Paleocene through lower Oligocene sequence was cored at Hole 738. Analysis of the stratigraphic distribution of over 125 planktonic foraminifer taxa from these sites reveals changes in species composition that were strongly influenced by the climatic evolution of antarctic water masses. Early Paleocene planktonic foraminifer assemblages are nearly identical in species composition to coeval assemblages from low and middle latitude sites, showing the same patterns of post-extinction recovery and taxonomic radiation. Late Eocene and early Oligocene assemblages exhibit considerably lower diversity than the older Eocene faunas, and were dominated by chiloguembelinids, subbotinids, and catapsydracids. An antarctic Paleogene zonal scheme previously devised for ODP Sites 689 and 690 in the Weddell Sea is used to biostratigraphically subdivide the Kerguelen Plateau sequence. (Auth. mod.)

E-50247

Huber, B.T., **Maestrichtian planktonic foraminifer biostratigraphy and the Cretaceous/Tertiary boundary at Hole 738C (Kerguelen Plateau, southern Indian Ocean)**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.451-465, 33 refs.

DLC QE39.T49b

A biostratigraphically complete Upper Maestrichtian-Danian sequence was recovered at ODP Leg 119 Site 738 on the southern Kerguelen Plateau. Planktonic foraminifers are abundant and well- to moderately preserved in all Upper Maestrichtian samples to within 6 cm of the Cretaceous/Tertiary boundary, where foraminifers are rare and poorly preserved due to increased sediment lithification. Lowermost Danian samples are also poorly preserved, but specimen abundance is sufficient for preliminary quantitative biostratigraphic analysis. Despite the poor foraminifer preservation, evidence is presented for paleoenvironmental change immediately below a thin, iridium-rich calcareous clay horizon that is recognized as the Cretaceous/Tertiary boundary. The recovered Maestrichtian planktonic foraminifers are identical to Austral Realm assemblages found in the southern South Atlantic region. All five species previously recognized as being endemic to this realm were recovered from Hole 738C. Lower Danian assemblages strongly resemble coeval low-latitude foraminifer faunas, whereas upper Danian assemblages differ only in the absence of indicator species, particularly the morozovellids. (Auth. mod.)

E-50248

Wei, W.C., Thierstein, H.R., **Upper Cretaceous and Cenozoic calcareous nannofossils of the Kerguelen Plateau (southern Indian Ocean) and Prydz Bay (East Antarctica)**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.467-493, Refs. p.483-485.

DLC QE39.T49b

Upper Pliocene through Quaternary sediments were recovered at Site 736 on the northern Kerguelen Plateau; calcareous nannofossils occurred in only a few samples. Over 700 m of Middle Eocene through Quaternary sediments was cored at Site 737 on the northern Kerguelen Plateau, and calcareous nannofossils are abundant in the Middle Eocene through the Middle Miocene sediments. Nearly 500 m of sediments ranging from the Lower Turonian to the Quaternary was recovered at Site 738 on the southern Kerguelen Plateau; calcareous nannofossils are abundant from the Miocene downward, and also in the Upper Eocene through Miocene section from Site 744 on the southern Kerguelen Plateau. Except for Core 119-746A-13H, the Neogene sequences drilled at deep-water Sites 745 and 746 off the southern Kerguelen Plateau are devoid of calcareous nannofossils. Their occurrences were generally rare and sporadic at Sites 739 and 742 in Prydz Bay and suggest that the diamictite sequences recovered are as old as Middle Eocene-Early Oligocene age. Other sites drilled in Prydz Bay (Sites 740, 741, and 743) yielded no calcareous nannofossils. (Auth. mod.)

E-50249

Wei, W.C., Pospichal, J.J., **Danian calcareous nannofossil succession at Site 738 in the southern Indian Ocean**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.495-512, Refs. p.505-507.

DLC QE39.T49b

An apparently complete Danian section was recovered at ODP Site 738 on the southern Kerguelen Plateau. Calcareous nannofossils are abundant and moderately preserved in the section. A number of taxa common in middle or low latitudes, such as *Braarudosphaera*, *Biscutum? romeinii*, *Biscutum? parvulum*, *Cyclagelosphaera*, *Octolithus multiplus*, and *Toweius petalosus* are absent at Site 738. On the other hand, a bloom of *Hornibrookina* occurs at Site 738 only slightly (15 cm) above the Cretaceous/Tertiary boundary as defined by the iridium peak. Species of *Chiasmolithus* and *Prinsius* are very abundant. This gives the nannofossil assemblages distinct high-latitude characteristics and suggests significant latitudinal thermal gradients in the Danian oceans. A Danian nannofossil zonation for the antarctic region is proposed which utilizes traditional markers and several nontraditional markers, i.e., the first occurrences of *Hornibrookina*, *Prinsius martinii*, and *Chiasmolithus bidens*, and the last occurrence of *Hornibrookina teuriensis*. Quantitative analyses of the calcareous nannofossil assemblages from Site 738 reveal four steps of rapid floral changes in the early Danian before relatively stable nannofloral conditions were reached at about 63.8 Ma. (Auth.)

E-50250

Caulet, J.P., **Radiolarians from the Kerguelen Plateau, Leg 119**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.513-546, Refs. p.540-542.

DLC QE39.T49b

Radiolarians are abundant and well preserved in the Neogene of the Kerguelen Plateau. They are common and moderately to well preserved in the Oligocene sequences of Site 738, where the Eocene/Oligocene boundary was observed for the first time in subantarctic sediments, and Site 744. Radiolarians are absent from all glacial sediments from Prydz Bay. Classical Neogene stratigraphic markers were tabulated at all sites. Correlations with paleomagnetic ages were made at Sites 745 and 746 for 26 Pliocene-Pleistocene radiolarian events. Many Miocene to Holocene species are missing from Sites 736 and 737, which were drilled in shallow water (less than 800 m). The missing species are considered to be deep-living forms. Occurrences and relative abundances of morphotypes at 6 sites are reported. Two new genera and 17 new species are described from the Middle Eocene to Oligocene sediments at Sites 738 and 744. Twenty-seven stratigraphic events are recorded in the Middle to Late Eocene of Site 738, and 27 additional stratigraphic datums are recorded, and correlated to paleomagnetic stratigraphy in the Early Oligocene at Sites 738 and 744. Eight radiolarian events are recorded in the Late Oligocene at Site 744. New evolutionary lineages are proposed for *Calocyclus semipolita* and *Prunopyle tryppyrena*. (Auth. mod.)

E-50251

Baldauf, J.G., Barron, J.A., **Diatom biostratigraphy: Kerguelen Plateau and Prydz Bay regions of the southern ocean**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.547-598, Refs. p.583-585.

DLC QE39.T49b

Samples were examined for diatoms from 22 holes at 11 sites cored by ODP Leg 119 on the Kerguelen Plateau and in Prydz Bay. Diatoms were observed in Oligocene through Holocene sediments recovered from the Kerguelen Plateau. The diatom flora from the Kerguelen Plateau is characterized by species such as *Azpeitia oligocenica*, *Rocella gelida*, *Rocella vigilans*, and *Synedra jouseana* in the Oligocene, and *Crucidentacula nicobarica*, *Denticulopsis hustedtii*, *Nitzschia mioce-nica*, and *Thalassiosira miocenica* in the Miocene. This somewhat cosmopolitan assemblage gives way to a Pliocene and Holocene assemblage

characterized by species such as *Nitzschia kerguelensis*, *Thalassiosira inura*, and *Thalassiosira torokina*, which are endemic to the southern ocean region. Samples examined from Prydz Bay are generally devoid of diatoms. The exception is Site 739, where diatoms occur sporadically in Lower Oligocene and Upper Miocene through Quaternary sediments. The Leg 119 diatom biostratigraphic results allow the development of a stratigraphic framework for the Indian sector of the southern ocean. (Auth. mod.)

E-50252

Stockwell, D.A., **Distribution of *Chaetoceros* resting spores in the Quaternary sediments from Leg 119**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.599-610, 18 refs.

DLC QE39.T49b

During Leg 119 of the Ocean Drilling Program (ODP), Quaternary sediments of the southern ocean were examined for the presence and abundance of *Chaetoceros* resting spores. Six drill sites were occupied along the Kerguelen Plateau. An additional 5 drill sites were clustered within Prydz Bay. *Chaetoceros* resting spores were present at all sites examined. These assemblages were comprised primarily of *Chaetoceros neglectus* and several unidentified *Chaetoceros* species. Resting spore assemblages accounted for approximately 20% of the total diatom assemblage (ranging from 0 to 91.4% of any given sample). Quantitative estimates of resting spores demonstrated considerable downcore abundance fluctuations, ranging from 0 to 1.82×10^9 valves/g sediment. The highest spore production rates (3.75×10^{12} spores/cm²/yr) were found on the northern Kerguelen Plateau. A lack of adequate chronological control at all sites prevented proper between-core comparisons. Mean resting spore abundance, however, appeared highest within the sediments of Prydz Bay and across the northern Kerguelen Plateau. Deep-water stations of the southern Kerguelen Plateau demonstrated the lower spore abundances and a reduction in the percentage contribution of spore to the total diatom assemblage. (Auth.)

E-50253

Schröder-Adams, C.J., **Middle Eocene to Holocene benthic foraminifer assemblages from the Kerguelen Plateau (southern Indian Ocean)**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.611-630, Refs. p.622-623.

DLC QE39.T49b

Middle Eocene to Holocene benthic foraminifers were studied in sediments from Sites 736, 738, and 744 (Kerguelen Plateau). Significant faunal changes took place in the Middle Eocene/Early Oligocene, Middle Miocene, and Late Miocene. The benthic assemblages are characterized by gradual species replacements. Assemblage boundaries are defined where first appearance datums (FADs) and last appearance datums (LADs) concentrate. The Eocene fauna was dominated by *Nuttallides truempyi*. Buliminids became important at the end of the Eocene and in the Early Oligocene *Nuttallides umbonifera* became dominant. The FAD of *N. umbonifera* is coeval with the onset of the first paleoceanographic indications, such as ice rafted material, of antarctic glaciation. The establishment of the Antarctic Circumpolar Current in the Middle Oligocene is reflected at Site 738 by an erosional hiatus. The increase in relative abundance of *N. umbonifera* at Site 744 during the same interval indicates cold, carbonate-corrosive bottom water. *Epistominella exigua* dominates the bathyal to abyssal Upper Miocene to Holocene sediments at Sites 744 and 738, preferring the high supply of organic matter associated with increased upwelling near the Antarctic Convergence. Site 736 has a benthic fauna, highly diluted by biosiliceous sedimentation. Significant increases of benthic foraminiferal numbers may indicate changes of the Polar Front during Pliocene/Pleistocene time. (Auth.)

E-50254

Tocher, B.A., **Late Cretaceous dinoflagellate cysts from the southern Kerguelen Plateau, Site 738**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart,

College Station, Texas A and M University, 1991, p.631-633, 6 refs.

DLC QE39.T49b

Forty-one samples from the lower section (between approximately 370 and 495.5 mbsf) drilled at ODP Site 738 (southern Kerguelen Plateau) were analyzed for their palynomorph content. The majority proved to be palynologically barren. Twenty-one species and subspecies of dinoflagellate cysts were recorded, however, from the 8 samples that proved productive. The irregular distribution of the cysts makes accurate age determinations difficult, particularly for the lower part of the succession. However, species recovered from Cores 119-738C-21R to 119-738C-23R indicate a latest Maastrichtian age. (Auth.)

E-50255

Droser, M.L., Bottjer, D.J., **Trace fossils and ichnofabric in Leg 119 cores**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.635-641, 20 refs.

DLC QE39.T49b

Trace fossils and ichnofabric were examined from cores of Late Cretaceous to Quaternary age recovered from the Kerguelen Plateau, Indian Ocean. Nearly all of the strata are completely bioturbated, with ichnofabric index 6 most commonly recorded. Preserved discrete trace fossils include *Chondrites*, *Planolites*, *Zoophycos*, and *Thalassinoides*. A continuous Cretaceous/Tertiary boundary section preserved at ODP Site 738 occurs within a 15 cm-thick interval of laminated sediments. The lack of bioturbation indicates the disappearance of bioturbating organisms from the seafloor, possibly as a result of the same factors that caused the mass extinction or changes in other environmental conditions—most probably bottom-water oxygen concentrations.

E-50261

Schmitz, B., et al, **Element stratigraphy across the Cretaceous/Tertiary boundary in Hole 738C**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.719-730, Refs. p.729-730.

DLC QE39.T49b

Neutron activation analyses of iridium and other chemical elements were performed across a 1 m-thick, partly nonbioturbated clay-rich interval at the Cretaceous/Tertiary boundary in ODP Hole 738C. The results show that the boundary interval holds one of the highest Ir enrichments (320 ng Ir/cm^2) of all known Cretaceous/Tertiary boundary layers. Iridium concentrations are highest (18 ppb Ir, whole-rock samples) a few centimeters above the base of the clay-rich interval and gradually tail off upsection. Compared with background levels the most Ir-rich interval also shows strongly enhanced concentrations of Cr (215 ppm) and slightly elevated Co concentrations (13 ppm). Rare earth element (REE) abundance patterns change considerably across the Cretaceous/Tertiary boundary interval, reflecting either a change in Cretaceous/Tertiary boundary seawater REE composition or the occurrence of different REE fractionation processes due to changing depositional environment. Element-vs.-element ratios of Hf, Ta, Th, U, Cs, and Sc are similar between the most Ir-rich layers of the boundary section and other levels with lower Ir concentrations. (Auth. mod.)

E-50262

Barrera, E., Barron, J., Halliday, A., **Strontium isotope stratigraphy of the Oligocene-Lower Miocene section at Site 744, southern Indian Ocean**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.731-738, 23 refs.

DLC QE39.T49b

⁸⁷Sr/⁸⁶Sr ratios of well-preserved early Miocene- Oligocene planktonic foraminifers from Site 744 in the southern Indian Ocean provide the highest southern latitude Sr isotope record of this age. The isotopic data have been calibrated with the site magnetostratigraphy. ⁸⁷Sr/⁸⁶Sr ages were also determined using the Sr isotope-age equations of Miller et

al. (1988) and Hess et al. (1989). There is good agreement between the calculated ages from $^{87}\text{Sr}/^{86}\text{Sr}$ measurements using these equations and those derived from magnetobiostratigraphy. In addition, these equations were useful for inference of sediment ages in intervals where the paleomagnetic record is not well resolved and the biostratigraphy is inconclusive. The Site 744 $^{87}\text{Sr}/^{86}\text{Sr}$ record can be used for correlation of antarctic and low-latitude sequences and biostratigraphical zonation of foraminifers, radiolarians, diatoms, and calcareous nannofossils. This record will assist in the development of the high southern latitude biochronology. (Auth.)

E-50263

Thierstein, H.R., et al, **Age determinations of Paleogene diamictites from Prydz Bay (Site 739), Antarctica, using Sr isotopes of mollusks and biostratigraphy of microfossils (diatoms and coccoliths)**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.739-745, 24 refs.

DLC QE39.T49b

Age dating of Paleogene diamictites from ODP Site 739 in Prydz Bay with marine microfossils (diatoms and calcareous nannofossils) suggests the build-up of a major East Antarctic ice shield in latest Eocene to earliest Oligocene time, about 35-38 m.y.a. Strontium isotopic analyses of small mollusk remains found within these diamictites, however, yield younger ages ranging from 29 to 23 Ma (i.e., latest Early Oligocene to earliest Miocene). These age discrepancies could be caused by repeated glacial reworking of microfossils, macrofossils and sediment clasts through the late Oligocene, or alternatively by ion exchange in the still aragonitic mollusk shells. (Auth.)

E-50264

Domack, E.W., Jull, A.J.T., Donahue, D.J., **Holocene chronology for the unconsolidated sediments at Hole 740A: Prydz Bay, East Antarctica**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.747-750, 11 refs.

DLC QE39.T49b

Unconsolidated sediments recovered at Site 740 include approximately 23 m of interbedded siliceous ooze and silty clay (pebbly mud), which was tentatively assigned a Late Pliocene to Quaternary age by onboard scientists. In order to clarify the chronology of this sequence, 6 samples of siliceous ooze were analyzed for their ^{14}C content. Uncorrected ages ranged from 1915 \pm 50 yr B.P. (0.21 mbsf) to 11,140 \pm 75 yr B.P. (15.80 mbsf). These ages provide estimates for interval sedimentation rates of the siliceous ooze, which varied from 0.150 to 0.067 cm/yr. A reservoir correction of 1750 yr is used to determine absolute ages for the sample intervals. These dates ranged from 165 to 9390 ^{14}C yr B.P. Overall sediment-accumulation rates vary from 0.144 to 0.187 cm/yr, with maximum rates associated with the pebbly muds rather than the siliceous oozes. Extrapolated sedimentation rates and reservoir corrections allow for an age estimate of about 10,700 yr B.P. for the initiation of open-marine conditions at Site 740. Resumption of terrigenous sedimentation with increased ice rafting took place from approximately 7300 to 3800 yr B.P. This may have been related to the readvance of floating ice tongues along the eastern side of Prydz Bay. (Auth.)

E-50266

Keating, B.H., Sakai, H., **Magnetostratigraphic studies of sediments from Site 744, southern Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.771-794, 6 refs.

DLC QE39.T49b

Site 744 is situated on the southern Kerguelen Plateau at a water depth of 2307 m. The objective in drilling there was to obtain a reference biostratigraphic and magnetostratigraphic section for the Tertiary. The sediments are pelagic in nature, and the presence of a small amount of calcium carbonate was interpreted as an indication that the site had been

situated above the calcium compensation depth (CCD) since the Late Eocene. A transition from nannofossil ooze to diatomaceous ooze may reflect the northward migration of the polar front in the Late Miocene. Three holes were drilled at Site 744. Cores from Holes 744A and 744B were studied as part of the shipboard analysis using the pass-through cryogenic magnetometer. Core from Hole 744C was reserved for core repository tests and sampling was not permitted. Hole 744A sampled the upper 180 m of the sedimentary sequence; Hole 744B sampled only 80 m. It was difficult to correlate the two reversal sequences due to the software analysis problem, which left many indeterminate sections. The reversal sequence derived from the shipboard analysis was a composite of the records from both Holes 744A and 744B. (Auth mod.)

E-50267

Keating, B.H., Sakai, H., **Amery Group red beds in Prydz Bay, Antarctica**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.795-809, Refs. p.808-809.

DLC QE39.T49b

A thick sequence of continental red beds was drilled at ODP Site 740 on the continental margin of Antarctica. The red beds lack dateable fossils. Paleomagnetic studies were undertaken to establish the age of formation for these rocks. Many of the rocks sampled were found to be thermally remagnetized and yielded paleomagnetic inclinations similar to those of intrusive units within outcrops of red beds in Antarctica. Based upon the similarities in lithology, sequence of rock types, thickness, magnetic properties, and thermal histories, a correlation is made with the Amery Group of Permian age. Red beds of this group are exposed in the Prince Charles Mountains, inland from Prydz Bay. (Auth.)

E-50268

Barron, J.A., et al, **Biochronologic and magnetostratigraphic synthesis of Leg 119 sediments from the Kerguelen Plateau and Prydz Bay, Antarctica**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.813-847, Refs. p.846-847.

DLC QE39.T49b

This paper summarizes the biostratigraphy and magnetostratigraphy of the 11 sites drilled on the Kerguelen Plateau and in Prydz Bay during ODP Leg 119. Excellent magnetobiochronologic reference sections were obtained at deep-water Sites 745 and 746 (0-10 Ma) and at intermediate depth Site 744 (0-39 Ma) on the southern Kerguelen Plateau. Site 738, an intermediate depth companion site for Site 744, contains a nearly complete lowermost Oligocene to Turonian carbonate section including a continuous sequence across the Cretaceous/Tertiary boundary. Northern Kerguelen Sites 736 and 737 (ca. 600 m water depth) constitute a composite Middle Eocene to Quaternary reference section near the present-day Antarctic Polar Front. Biostratigraphic control is limited in Prydz Bay Sites 739-743. Glacial sequences cored on the continental shelf at Sites 739 and 742 appear to form a composite record, possibly from the uppermost Middle Eocene to the Quaternary; the entire Upper Oligocene and most of the Miocene, however, are removed at an unconformity. Preglacial sediments at Site 741 contain Early Cretaceous pollen and spores, but the red beds cored at Site 740 are unfossiliferous. Poorly-fossiliferous glacial sediments of probable Quaternary age were sampled on the upper slope at Site 743. (Auth.)

E-50269

Thierstein, H.R., et al, **Cretaceous/Tertiary boundary at Site 738, southern Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.849-867, Refs. p.859-861.

DLC QE39.T49b

High-resolution stratigraphic evidence of an apparently complete carbonate-rich Cretaceous/Tertiary boundary interval in Section 119-738C-20R-5 from the southern Kerguelen Plateau is summarized and interpreted. The change of the calcareous nannoflora and of the plank-

tonic foraminifers is spread over a laminated interval of about 15 cm thickness. The base of this interval lies in uppermost Maestrichtian chinks, 2 cm below a distinct 2 mm-thick "gray clay" layer, which shows the highest iridium enrichment (18 ppb) measured in this section. No shocked quartz or microspherules, characteristic of an impact, were found. No change in the clay mineralogy, which might be expected for a large volcanic or impact event, could be identified. Elevated metal and iridium concentrations (>1.6 ppb) occur already in the bioturbated uppermost Maestrichtian chinks several centimeters below the "gray clay" and decrease above the iridium peak gradually over a laminated 12 cm-thick interval to background values of 0.1-0.3 ppb Ir. Application of bio- and magnetostratigraphy shows that the accumulation rates of carbonates and clays, but not of the metals, decreased dramatically at the Cretaceous/Tertiary boundary, hence the lack of dilution may have led to the observed metal concentrations. (Auth.)

E-50270

Barron, J.A., Larsen, B., Baldauf, J.G., **Evidence for Late Eocene to Early Oligocene antarctic glaciation and observations on Late Neogene glacial history of Antarctica: results from Leg 119**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.869-891, Refs. p.889-891.

DLC QE39.T49b

Although scientific evidence prior to that from ODP Leg 119 indicates the presence of an ice sheet on East Antarctica by at least the earliest Oligocene, the question as to the size and stability of that initial ice sheet is still contested. Current hypotheses include the presence of a small ice sheet in the earliest Oligocene with stepwise growth during the Neogene; the presence of a continental-sized ice sheet in the late Middle Eocene with no major evidence of subsequent deglaciation; and the presence of glacial ice in the earliest Oligocene with a major ice sheet during the mid-Oligocene, followed by growth and decay of several ice sheets with characteristics similar to the temperature ice sheets of the Pleistocene of North America but with changes over a longer time scale (millions of years vs. 100,000 yr). Principal results from Leg 119 suggest the presence of significant late Middle and Late Eocene glaciation in East Antarctica and the presence of a continental-size ice sheet in East Antarctica during the earliest Oligocene. (Auth.)

E-50271

Dorn, W.U., **High-resolution magnetic susceptibility and carbonate records: southern Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.895-901, 6 refs.

DLC QE39.T49b

High-resolution (5 cm interval) whole-core magnetic susceptibility measurements were made during ODP Leg 119 for Sites 744 and 745, located on the southern Kerguelen Plateau. The magnetic log of Hole 744B is completed by carbonate analyses based on tightly spaced samples (7 samples per section; approximately 20 cm intervals). Initial results indicate an inverse relationship between susceptibility values and percent carbonate. The data sets represent a potential base for within-site hole cross-correlations and global paleoenvironmental studies. (Auth.)

E-50272

Cranston, R.E., **Higher resolution geochemical data, Leg 119**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.903-931, 6 refs.

DLC QE39.T49b

Higher resolution pore-water samples were recovered at intervals of 0.3 to 3 m from selected cores during Leg 119 in order to identify zones where active geochemical reactions were occurring. In addition to shipboard measurements, solid- and dissolved-phase samples were analyzed at a shore-based laboratory. Solid-phase samples were analyzed for redox conditions, carbon, total metals, and leachable metals. Pore-water

samples were analyzed for ammonia, silica, sulfate, and major cations. Data are presented in tables for 400 samples from Site 739 in Prydz Bay and Sites 736, 737, 744, 745, and 746 at the Kerguelen Ridge. (Auth.)

E-50273

Bukry, D., **Oligocene and Quaternary silicoflagellates from the Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.933-934, 6 refs.

DLC QE39.T49b

The occurrence of Quaternary and Oligocene silicoflagellates at two ODP Leg 119 Holes (736A and 744A) on the Kerguelen Plateau was investigated to compare species distributions to Northern Hemisphere floras. Tabulated data determined for 24 samples, and a few preliminary remarks, are presented. Quaternary assemblages of Hole 736A are noteworthy for the absence of key North Pacific zonal guide species. Other species such as *Distephanus floridus*, *Distephanus speculum elongatus*, and *Mesocena octagona* show limited ranges in Hole 736A and may help to subdivide the Quaternary locally. The Late Oligocene assemblages of Hole 744A contain widely distributed species of *Distephanus* and *Naviculopsis*, which permit correlation to lower latitude assemblages. They also contain the high-latitude acme of *Distephanus raupii*. (Auth. mod.)

E-50274

Woodruff, F., Chambers, S.R., **Middle Miocene benthic foraminiferal oxygen and carbon isotopes and stratigraphy: southern ocean Site 744**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.935-939, 9 refs.

DLC QE39.T49b

Carbon and oxygen isotope values and planktonic/benthic ratios are presented for Middle Miocene (11-17.5 Ma) foraminifers deposited at Hole 744B of the Kerguelen Plateau. Major features of the isotope records are similar to those of other Middle Miocene open-ocean records. The portion of the sequence containing the major Middle Miocene $\delta^{18}\text{O}$ increase (between 60 and 52 m below seafloor) is a relatively condensed zone characterized by low planktonic/benthic ratios and several hiatuses. The isotopic record is of sufficiently high resolution to date the $\delta^{18}\text{O}$ minima and the $\delta^{13}\text{C}$ maxima to within 200,000 yr. Ages determined by oxygen and carbon isotope stratigraphy are similar to those obtained using diatom, radiolarian, and paleomagnetic stratigraphy, but are approximately 1 m.y. younger than those determined by strontium isotope stratigraphy. The average middle Miocene sediment-accumulation rate for Hole 744B is approximately 4 m/m.y. (Auth. mod.)

E-50275

Truswell, E.M., **Data report: palynology of sediments from Leg 119 drill sites in Prydz Bay, East Antarctica**, Proceedings of the Ocean Drilling Program, Vol. 119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.941-945, 17 refs.

DLC QE39.T49b

Samples from 4 drill sites in Prydz Bay were examined with the aim of determining the age of the oldest lithological units penetrated at each site. Lithological considerations have made age assessment difficult; most samples are diamictites, and contain several generations of pollen and spores which have been recycled from older deposits by glacial processes. Palynomorphs identified fall into 3 major groups: Permian spores and pollen, Cretaceous and Tertiary spores and pollen, and Early Tertiary dinoflagellates. At Site 740, where reddish and green sandstones and siltstones represent the oldest part of the drilled sequence, recovery of palynomorphs was too sparse to resolve the age of this unit. At Site 741, grey sandstones and siltstones at the sampled base yielded an abundance of Early Cretaceous, probably Albian, spores and pollen; there is little evidence for a recycled origin. At Site 742, the oldest sampled section yielded depauperate spore and pollen floras which are possibly Late Cre-

taceous in age, although rare Eocene dinoflagellates are present. Basal sediments at Site 739 are diamictites which contain sparse, apparently recycled floras, and must be as young as Eocene or Oligocene. (Auth.)

E-50282

Shiraishi, K., et al, **Cambrian orogenic belt in East Antarctica and Sri Lanka: implications for Gondwana assembly**, *Journal of geology*, Jan. 1994, 102(1), p.47-65, 68 refs.

Ion microprobe U-Pb dating of zircons from the Lützow-Holm Complex (LHC) and the Yamato-Belgica Complex (YBC), East Antarctica indicate that high-grade regional metamorphism and associated folding of LHC occurred between 521 and 553 Ma. This shows for the first time the existence of a Cambrian orogenic belt within the East Antarctic Shield. Many zircons from the LHC contain cores that record inherited ages from 2900 to 1500 Ma. Components of 1000 Ma zircon have been identified in three locations. This may indicate the maximum age of the deposition of LHC. The work enables an improved fit to the once contiguous fragments of Gondwana. The Highland/Southwestern Complex (HSWC) of Sri Lanka has remarkable petrological similarities to the LHC. The presence of 500 and 1000 Ma metamorphic ages for the Vijayan Complex and the Wannai Complex of Sri Lanka correlate respectively with the YBC and the Rayner Complex, Antarctica. Moreover, integrating the recent geochronological and petrological data from Sri Lanka enables this reinterpretation of the deep crustal evolution of Sri Lankan complexes defined on the basis of the Sm-Nd model age mapping. Once contiguous, LHC in East Antarctica and HSWC of Sri Lanka developed in the suture zone at the very last phase of Gondwana construction during the Pan-African orogeny. This suggests that the Late Proterozoic supercontinent was separated by a missing ocean at the position of the LHC, and that this might continue to the "Mozambique Ocean" through Sri Lanka and the southernmost tip of India. (Auth. mod.)

E-50284

Takeda, H., Mori, H., Bogard, D.D., **Mineralogy and ^{39}Ar - ^{40}Ar age of an old pristine basalt: thermal history of the HED parent body**, *Earth and planetary science letters*, Mar. 1994, 122(1/2), p.183-194, 16 refs.

Earlier evidence suggests that, in addition to initial crystallization and rapid cooling, the antarctic Y75011,84 clast experienced shock deformation, reheating of short duration at higher temperature, and brecciation. These characteristics suggest two or more impact events. Fe-rich olivine filling fractures in pyroxene may have been introduced during the accompanying shock fracturing. The inferred ^{39}Ar - ^{40}Ar degassing ages for Y75011 matrix and clast,84 are 3.94 Ga and 3.98 Ga, respectively. The suggested degassing age for a clast from Y790020, believed to be paired with Y75011, is 4.03 Ga, but could be younger. It seems likely that all three samples experienced a common degassing 3.95 Ga ago, but one cannot rule out two or more events spaced over a 0.1 Ga interval. Higher temperature extractions of the two clast samples show significantly older apparent ages up to 4.5 Ga, and suggest that the time/temperature regime of this event was not sufficient to degas Ar totally. Most likely, the K-Ar ages were reset by thermal metamorphism associated with one or more impact events associated with shock fracturing, formation of Fe-rich olivine veins, and/or meteorite brecciation. The pyroxene annealing that commonly occurs in many eucrites is likely to be a much earlier process than the impact-produced textural changes and reset K-Ar ages observed in these meteorites. The existence of mineralogical and chronological evidence for metamorphism in an otherwise pristine eucrite suggests that the HED parent body experienced an extensive degree of early cratering. (Auth. mod.)

E-50317

Hammer, W.R., Hickerson, W.J., **Crested theropod dinosaur from Antarctica**, *Science*, May 6, 1994, 264(5160), p.828-830, 12 refs.

Jurassic fossil vertebrates collected from the Falla Formation in the Central Transantarctic Mountains include a partial skull and postcranial elements of a crested theropod, *Cryolophosaurus ellioti* gen. nov. sp. nov. The theropod bears some resemblance to the large tetanurans of the Middle to Late Jurassic but also has primitive ceratosaurian features. Elements from a prosauropod, teeth from scavenging theropods, a ptero-

saur humerus, and a tritylodont molar were also recovered. The presence of this fauna suggests that a mild climate existed at high paleolatitude in this area of Gondwana during the Early Jurassic. (Auth.)

E-50335

Domack, E.W., **Modern carbon-14 ages and reservoir corrections for the Antarctic Peninsula and Gerlache Strait area**, *Antarctic journal of the United States*, 1992, 27(5), p.63-64, 2 refs.

The establishment of a reliable chronology for antarctic marine sediments depends upon accurate regional reservoir corrections. A complete understanding of how the reservoir correction varies also provides useful information on the carbon cycle in antarctic nearshore environments. Nine carbon-14 analyses on modern and near-modern samples of organic carbon, obtained during the continuing investigation of sedimentation within fjords of the Antarctic Peninsula, show that the local reservoir age is most likely around 1,200 years. In addition, the presence of reworked POC (particulate organic carbon) in nearshore areas introduces considerable uncertainty into radiocarbon age. Alternately, the effects of glacial melt in nearshore areas may be influencing the carbon dioxide reservoir of surface waters.

E-50336

Domack, E.W., Ishman, S., **Magnetic susceptibility of antarctic glacial marine sediments**, *Antarctic journal of the United States*, 1992, 27(5), p.64-65.

The authors measured the magnetic susceptibility of 3 piston cores from the Gerlache Strait area of western Antarctic Peninsula in order to develop the method as a means of correlation between cores and as an aid to the sedimentological interpretation of individual cores. All 3 cores are siliceous muds that are visually homogeneous. There is a similar pattern to the susceptibility records of the 3 cores in that there is a relatively high but variable susceptibility interval that overlies a low and constant susceptibility interval. The depth at which the transition takes place varies from core to core, which suggests that there is a difference in the sedimentation rate of the cores. If this is indeed the case, then it implies a basin-wide change in depositional conditions.

E-50337

Domack, E.W., Mashiotta, T.A., Venkatsen, M.I., **Preservation of primary productivity signal in antarctic fjord sediments: Andvord Bay, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.66-67, 5 refs.

This study is an interdisciplinary investigation into the paleoproductivity of an antarctic fjord based on sedimentologic and biogeochemical studies of a 9 m-long piston core collected from Andvord Bay in early 1988 as part of R/V *Polar Duke* cruise III. The chronology of core 22 extends back for approximately the last 3,000 years as based upon a set of 5 radiocarbon ages that range in age from 2025 \pm 60 to 4480 \pm 75 y. These data result in a linear accumulation rate of 0.305 cm per year and interval rates of 0.23 and 0.52 cm per year for the upper and lower portions of the core respectively. Interpretation of the data would suggest that the fluctuations in primary productivity responsible for the changes in TOC (total organic carbon) below 550 cm are a reflection of greater sedimentation rates and that this in turn is driven by higher primary productivity in the period before 2,400 years ago.

E-50338

LaBrecque, J.L., Ghidella, M.E., **Estimates of bathymetry, depth to magnetic basement, and sediment thickness for the western Weddell Basin**, *Antarctic journal of the United States*, 1992, 27(5), p.68-70, 25 refs.

The authors determined the relationship between gravity and bathymetry, or the admittance function, for a reference region where both the gravity and bathymetry have been mapped, and applied the admittance function as a transfer function to estimate bathymetry in a region where only gravity was available. They selected the northwestern Weddell, where bathymetry has been relatively well measured by satellite-navigated icebreakers, as the reference area. For 127 soundings distributed over the region, the mean difference between predicted and observed topography averaged less than 80 m, with a standard distribution of 52 m. A maximum error occurred in the interpolated region at

70.3S and 55W, where the gravity field displays a strong negative seaward gradient. The estimated topography was 2,406 m, while the measured depth is 1,130 m, suggesting a very steep continental slope to the east of this point. This study demonstrates the utility of long-range aeromagnetic and aerogravity surveys in estimation of the crustal structure of the antarctic margins.

E-50341

DeMaster, D.J., et al, **Accumulation and regeneration of biogenic silica and organic carbon in Ross Sea sediments**, *Antarctic journal of the United States*, 1992, 27(5), p.74-76, 4 refs.

This study evaluates lateral transport of material based on data from current meters and transmissometers moored at three Ross Sea locations for a period of two years (1990-1992). Biogenic silica, organic carbon, organic nitrogen, and total phosphorus contents are being measured on samples from both the 1990 and the 1992 cruises. Biogenic silica and organic carbon contents are greatest in sediments from the southwestern Ross Sea (approximately 40 weight percent silica and 1.2 weight percent organic carbon) and decrease toward the east and north to 1-5% silica and 0.3% organic carbon.

E-50369

Mittlefehldt, D.W., **ALH84001, a cumulate orthopyroxenite member of the martian meteorite clan**, *Meteoritics*, Mar. 1994, 29(2), p.214-221, 38 refs.

ALH84001, originally classified as a diogenite in the antarctic meteorite collection, is a coarse-grained, cataclastic, orthopyroxenite meteorite related to the martian (SNC) meteorites. The orthopyroxene is relatively uniform in composition, with a mean composition of $Wo_{3.3}En_{69.4}Fs_{27.3}$. Minor phases are euhedral to subhedral chromite and interstitial maskelynite, $An_{31.1}Ab_{63.2}Or_{5.7}$, with accessory augite, $Wo_{42.2}En_{45.1}Fs_{12.7}$, apatite, pyrite and carbonates, $Cc_{11.5}Mg_{58.0}Sd_{29.4}Rd_{1.1}$. The pyroxenes and chromites in ALH84001 are similar in composition to these phases in EETA79001 lithology A megacrysts but are more homogeneous. Maskelynite is similar in composition to feldspars in the nakhlites and Chassigny. Two generations of carbonates are present, early (pre-shock) strongly zoned carbonates and late (post-shock) carbonates. The high Ca content of both types of carbonates indicates that they were formed at moderately high temperature, possibly 700 C, which is inconsistent with antarctic conditions. (Auth. mod.)

E-50371

Bryan, J.R., ed, Pospichal, J.J., ed, **Descriptions of sediments recovered by the 1986-1987 austral summer cruise of the R/V Polar Duke, United States Antarctic Program, Bransfield Strait, Antarctic Peninsula**, *Florida State University. Sedimentology Research Laboratory. Contribution*, Oct. 1993, No.58, 33p., Refs. p.25-31.

This volume contains descriptions of sediments obtained during the 1986-1987 austral summer cruise of the R/V *Polar Duke*, which surveyed the Bransfield Strait. This is the first sediment description volume to be published for *Polar Duke* material and is designed to serve the general geologic community by providing descriptive information of shallow sediments surrounding Antarctica and to assist geoscientists wishing to pursue more detailed studies by serving as a guide for sediment sampling. Included are: a summary of the scientific objectives of the 1986-1987 cruise of the *Polar Duke*, a discussion of core and grab sample recovery and processing, a table and map of station locations, an explanation of laboratory descriptive procedures, and lithologic descriptions of piston cores.

E-50375

Ellerman, P.J., **Depositional environments and post-depositional alteration of Cenozoic hyaloclastites in Antarctica**, Boulder, University of Colorado, 1992, 242p., University Microfilms order No.93-04553, Ph.D. thesis. Refs. p.223-235.

Alkaline hyaloclastites of Cenozoic age from Victoria Land, Ross I., Marie Byrd Land, and Deception I. were studied to determine their depositional environment and the nature of their post-emplacement alteration, with emphasis on mineralogical or chemical evidence which would distinguish between the products of marine vs freshwater hydro-

volcanism. Three sites were examined in detail: Castle Rock and the Turks Head District, both on Ross I., and Minna Bluff in southern Victoria Land. Laboratory procedures included thin section petrography, x-ray diffraction, scanning electron microscopy, electron microprobe analysis, neutron activation analysis, and thermal neutron capture prompt gamma ray spectrometry. Most of the hyaloclastites were hydrothermally altered at low temperatures by geothermal fields associated with the waning stages of the volcanism that produced the deposit or by later intrusive activity. The ubiquitous presence of early-formed phillipsite, and the persistence of relatively fresh glass in most of the antarctic samples regardless of age, suggest that following initial palagonitization and authigenic mineral formation, diagenesis proceeds slowly due to reduction in porosity and available exposed glass and also to the lack of free water in the antarctic environment. (Auth. mod.)

E-50376

Wolf, S.F., **Trace element study of H chondrites: evidence for meteoroid streams**, West Lafayette, Purdue University, 1993, 218p., University Microfilms order No.93-34441, Ph.D. thesis. Refs. p.209-217.

Multivariate statistical analyses, both linear discriminant analysis and logistic regression, of the volatile trace elemental concentrations in H4-6 chondrites reveal compositionally distinguishable subpopulations. Observed difference in volatile trace element composition between antarctic and non-antarctic H4-6 chondrites can be explained by a compositionally distinct subpopulation found in Victoria Land. This population of H4-6 chondrites is compositionally distinct from non-antarctic H4-6 chondrites and from antarctic H4-6 chondrites from Queen Maud Land. Comparisons of Queen Maud Land H4-6 chondrites with non-antarctic H4-6 chondrites do not give reason to believe that these two populations are distinguishable from each other on the basis of the ten volatile trace element concentration measured. ANOVA indicates that these differences are not the result of trivial causes such as weathering and analytical bias. Thermoluminescence properties of these populations parallel the results of volatile trace element comparisons. Given the differences in terrestrial age among Victoria Land, Queen Maud Land, and modern H4-6 chondrite falls, these results are consistent with a variation in H4-6 chondrite flux on a 300 ky timescale. This conclusion requires the existence of co-orbital meteoroid streams. (Auth. mod.)

E-50384

Chevallier, L., et al, **Volcanological features and preliminary geophysical investigations on Marion Island**, *South African journal of antarctic research*, 1992, 22(1-2), p.15-35, Refs. p.34-35.

Volcanological features indicate that Marion I. is active but has had a very low eruptive rate during the last 10,000 years. Nearly all Holocene activity occurred along radial fractures. An elongated northeast trending rift zone of maximum activity can be delineated in the southwestern sector of the island. The radial fractures and rift zone will probably control future eruptions, which may be expected to be of either hawaiian, strombolian or phreatomagmatic type. Geophysical investigations of a preliminary nature correlate well with these geological observations. A negative gravity anomaly coincides with the rift zone and may represent a magma chamber at a depth of 3 to 5 km below surface. Seismic recordings during a four-year period (1987 to 1991) detected only four minor events of local origin. These are ascribed to deep magma movements or elastic readjustments. The volcano thus appears not to have a very active shallow plumbing system. Ground magnetic profiles showed a different response between Pleistocene and Holocene lava flows and a distinct signature over dyke-intruded fractures. (Auth. mod.)

E-50389

Acevedo, R.D., Caselli, A.T., **Geology of Laurie I. and surrounding small islands of the South Orkneys** [Estudio geológico de las islas Orcadas del Sur, sector antártico argentino: a) isla Laurie e islotes aledaños], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1993, No.393, 42p., In Spanish with English summary. 21 refs.

The pre-Jurassic basement of Laurie I. and the small islands which surround it is described and analyzed. It consists of wackes and shales, locally extremely folded and low grade metamorphosed rocks of volca-

nic origin. As these turbidite deposits are intercalated with radiolarian and spilitic lavas, the unit is identified as typical of the flysch facies, whose structural style and lithic composition are similar to those of the Yahgan Formation (southern Patagonia) and the Trinity Peninsula Formation in Antarctica. (Auth. mod.)

E-50405

Brook, E.J., **Surface exposure geochronology using cosmogenic nuclides: applications in antarctic glacial geology**, *Woods Hole Oceanographic Institution. Doctoral dissertation*, Feb. 1994, MIT/WHOI-93-50, 230p., Ph.D. thesis. Refs. passim.

Cosmogenic ^3He , ^{26}Al , and ^{10}Be were measured in antarctic glacial deposits in the McMurdo Sound-Dry Valleys region to constrain surface exposure ages. Moraines deposited by the Taylor glacier have exposure ages from 120 kyr to 2 myr. ^{10}Be and ^3He ages of 122 ± 29 and 134 ± 54 kyr, respectively, for the Taylor II moraine are consistent with deposition during isotope stage 5e (120 kyr). Mean ^{10}Be exposure ages for older moraines in the valley of 362 ± 26 kyr (Taylor III), 1.1 ± 0.1 myr (Taylor IVa) and 1.9 ± 0.1 myr (Taylor IVb) suggest that major ice sheet advances during the last 2 myr were similar in extent to changes during the last glacial-interglacial cycle. Exposure ages for the "late Wisconsin" Ross Sea Drift, deposited on the coast of McMurdo Sound by the Ross Sea Ice Sheet, range from 8-106 kyr, suggesting that this deposit does not, as previously thought, represent a single ice advance in response to lowered sea level at the last glacial maximum. The data suggest instead that the Ross Sea Ice Sheet may have grounded and advanced on the coast several times during the last glacial period. (Auth.)

E-50406

McElroy, H.G., **Geochemical analysis of preserved organic sediment from Andvord Bay, Antarctica**, Clinton, NY, Hamilton College, 1994, 80p., B.A. thesis. Refs. p.72-80.

Evidence for 300-year cycles of preserved organic matter was found in a sediment core taken from Andvord Bay. Further evidence of this cyclicity from other sediment cores is necessary to verify the cycle's existence and to determine its cause. This study is aimed at finding data to support the suggestion that a 300 yr cyclicity does exist in antarctic fjord sedimentary sequences, and, through an understanding of the parameters which affect phytoplankton productivity and preservation, determining what causes these cycles. Data are obtained through an analysis of a second sediment core, also taken from Andvord Bay. The methodology of this investigation includes measuring the second core's total organic carbon content and magnetic susceptibility. If a thorough understanding of these cycles can eventually be attained, a basic knowledge of rapid change within antarctic productivity could be assumed. This knowledge of fine scale fluctuations could contribute to the interpretation of future climatic changes and lead to an increased understanding of climatic change. On a smaller scale, the fluctuations could help predict what effects global warming may have on the biological communities in polar regions, especially at the primary level. (Auth.)

E-50407

Rodriguez, A.B., **Geochemical sedimentological analysis of glacial marine sediments from the Palmer Deep Basin, Bellingshausen Sea, Antarctica**, Clinton, NY, Hamilton College, 1994, 48p., B.A. thesis. 19 refs.

Glacial marine sediments were examined from the Palmer Deep, located along the west coast of the Antarctic Peninsula on the Bellingshausen Sea continental shelf. Magnetic susceptibility, total organic carbon, and elemental analysis were performed on the core. The focus of this study is the analysis of magnetic susceptibility fluctuations in the top 625 cm of the core. High magnetic susceptibility indicates high hemipelagic sedimentation and low magnetic susceptibility indicates high pelagic sedimentation (productivity). Evidence for the type of variations in sedimentation being displayed by fluctuations in magnetic susceptibility is presented by observations that total organic carbon varies inversely with magnetic susceptibility; the plots of Sr, Al_2O_3 , CaO, K_2O , MgO, TiO_2 versus magnetic susceptibility and total organic carbon portray distinct positive and negative sloping trends; and the plot of SiO_2

versus magnetic susceptibility and total organic carbon portrays distinct negative and positive sloping trends. Possible events that explain these sedimentation cycles are periods of large storms. (Auth.)

E-50411

Ehrmann, W.U., **Cenozoic glacial history of Antarctica** [Die känozoische Vereisungsgeschichte der Antarktis], *Berichte zur Polarforschung*, 1994, No.137, 152p., In German with English summary. Refs. p.138-152.

This study combines results from drilling in anabyssal plains on isolated submarine elevations and on the continental slope and shelf of Antarctica. In addition, data from other parts of the southern ocean are considered, as well as data from the adjacent seas and rock outcrops on the antarctic continent. In order to gain a balanced and detailed view of the Cenozoic glacial history and climatic development, a wide range of parameters is discussed, including stable oxygen isotopes of benthic and planktic foraminifera, lithofacies, bulk mineralogy, clay mineralogy, ice-rafted debris, and microfossil assemblages. The cooling and warming history of the Continent is traced from the Paleocene through the Holocene, comparing earlier conditions with those prevailing in the twentieth century and describing features representative of the various eras through the 70 million years of the Cenozoic. (Auth. mod.)

E-50416

Webster, J.G., **Trace-metal behaviour in oxic and anoxic Ca-Cl brines of the Wright Valley drainage, Antarctica**, *Chemical geology*, Feb. 10, 1994, 112(3/4), p.255-274, 51 refs.

Trace-metal concentrations in the groundwater have been estimated and used to derive hypothetical concentrations for trace metals in the ancient brine pool from which Lake Vanda was formed. The results of this calculation support the premise that the trace-metal distribution profiles observed in Lake Vanda are attributable to the influx of trace metals from the Onyx River and to modern ongoing lake processes. In the Onyx River and in the oxic Ca-Cl brines of Lake Vanda and Don Juan Pond, trace-metal concentrations appear to be consistently controlled by adsorption and desorption from the surface of particulate Fe-oxides or Fe-hydroxides. Variations in the trace-metal concentrations measured in the oxic brines can be directly related to the effect of changes in pH and major-ion chemistry on the adsorption of each metal at the Fe-oxide surface. For the Onyx River and Lake Vanda, this hypothesis is presented as modification to the currently accepted model (Green et al., 1989) which postulates Cu and Ni adsorption onto particulate Mn-oxide. In the anoxic H_2S -bearing Ca-Cl brines at the base of Lake Vanda, Cu, Pb, Zn, Ni, Co and Fe concentrations appear to be limited by precipitation of metal-sulphide mineral phases and by the stability of metal-bisulphide and -polysulphide complex species. Mn is relatively mobile in the anoxic brine, but Mn concentrations may be limited by precipitation of an Mn-carbonate phase. (Auth. mod.)

E-50417

Borg, S.G., DePaolo, D.J., **Laurentia, Australia, and Antarctica as a Late Proterozoic supercontinent: constraints from isotopic mapping**, *Geology*, Apr. 1994, 22(4), p.307-310, 27 refs.

The reconstruction of Laurentia, Australia, and Antarctica into a Proterozoic supercontinent is evaluated by analyzing the fit of Precambrian provinces defined by isotopic and geochronologic mapping. Removal of the allochthonous provinces produces a closer fit of the continents; there is a match of Early Proterozoic basement between southwestern Laurentia and the only exposure of craton known from the paleo-Pacific margin of Antarctica. In addition, western Laurentia is brought closer to the Australian Gawler block, consistent with provenance interpretations of the Belt Supergroup. Removal of the allochthonous provinces by right-lateral translation relative to the antarctic craton margin places them in a pre-750 Ma position where they could be southwestward extensions of the Yavapai-Mazatzal and Grenville provinces of southern Laurentia. This modified reconstruction leads to a prediction of extensive Archean basement in Antarctica between the South Pole and Victoria Land, a prediction partly borne out by Archean rocks in the Miller Range of the Transantarctic Mountains. It also predicts the presence of 1.4 Ga rapakivi granites in the Transantarctic Mountains basement. This configuration implies assembly of the Australia-Antarctic Gondwana margin by terrane accretion following, or accompanied by,

left-lateral translation. This is compatible with a tectonic regime of clockwise rotation of Laurentia relative to Australia and Antarctica after rifting. Thus the proposed supercontinent, with some modifications, has potential for explaining several aspects of the pattern of Precambrian provinces in the three continents. (Auth. mod.)

E-50426

Rabinowitz, P.D., Francis, T.J.G., Pollard, G., Grout, R., Baldauf, J.G., **Ice management in high latitude scientific ocean drilling**, International Conference on Development and Commercial Utilization of Technologies in Polar Regions, 5th, Luleå, Sweden, Mar. 22-25, 1994. Proceedings. Polartech '94, Luleå, University of Technology, 1994, p.475-485, 9 refs.

The Ocean Drilling Programs' drillship *JOIDES Resolution* has proven itself a remarkably stable drilling platform for work in high latitudes. Exploration thus far in high latitude areas has taken place in the Northern Hemisphere in previously undrilled deep water sites of Baffin Bay, the Norwegian Greenland Sea and the Arctic Ocean. In the Southern Hemisphere the authors have drilled and recovered samples from the Weddell Sea and the sub-antarctic South Atlantic Ocean as well as in the high latitudes south of Kerguelen I. in the Indian Ocean and in Prydz Bay off Antarctica. Brief scientific summaries and ice management operations are discussed. (Auth.)

E-50430

Varela, L., **Fluvial drainage of melt streams** [Estudio sobre el escurrimiento fluvial de arroyos de deshielo], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1994, No.419, Structure and dynamics of coastal ecosystems at Jubany Station. Data report, p.31-35, In Spanish. 5 refs.

Hydrological studies carried out between Nov. 1992 and Feb. 1993 on Potter Peninsula, in areas free of glaciers, are described. Preliminary analysis of daily registers of fluvial drainage in one of the sections studied on Matías Stream shows variations between 0.20 and 0.40 sq.m, with velocity fluctuations between 0.7 m/s (Nov. 1992) and 0.25 m/s (Feb. 1993).

E-50431

Spolsky, B., Ventura, A., **Composition of material contributed by melt streams** [Composición del material aportado por los chorrillos: estudio preliminar], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1994, No.419, Structure and dynamics of coastal ecosystems at Jubany Station. Data report, p.36-41, In Spanish.

The relative contribution of microalgae and particulate matter from two melt streams flowing into Potter Cove was evaluated. Physical and chemical parameters were established and a qualitative analysis of the microalgae present in the water, as well as in the soil covered by the streams, was carried out. Preliminary data, presented in graphs and charts, are discussed. The total particulate matter suspended averaged 14.45 mg/l in one stream, and 0.86 mg/l in the other.

E-50455

Barnes, R.P., Riding, J.B., **Angular unconformity between the López de Bertodano and La Meseta Formations (Campanian-Maastrichtian and Eocene), Cockburn Island, northern Antarctic Peninsula**, *Journal of South American earth sciences*, Jan. 1994, 7(1), p.35-44, Refs. p.43-44.

A thick, largely shallow marine succession of Cretaceous and Lower Tertiary strata deposited in the James Ross Basin is well exposed on an archipelago of islands at the northern end of the Antarctic Peninsula. This succession was thought to be relatively continuous, particularly on Seymour I. where a thick Upper Cretaceous succession passes up into Paleocene and Eocene strata. Several unconformities present in the succession were thought to be relatively minor and have been ascribed to sea level changes. Equivalent sedimentary deposits of the López de Bertodano and La Meseta formations, Campanian/Maastrichtian and Lower Eocene respectively, are exposed on Cockburn I., less than 10 km from Seymour I. The contact between the two units is an unconformity with an angular discordance varying from 20 to 55 deg. Rotation of the López de Bertodano Formation corresponds with syn-sedimentary disruption

elsewhere in the basin throughout the Late Cretaceous and points to persistent instability. It is concluded that Cockburn I. includes a continuation of the Eocene unconformity of Seymour I., extending the trend for the base of the La Meseta Formation to onlap onto progressively older strata. This unconformity may mark a major phase of basin inversion, with tilting and uplift possibly affecting much of the James Ross Basin at this time. (Auth. mod.)

E-50456

Wever, H.E., Millar, I.L., Pankhurst, R.J., **Geochronology and radiogenic isotope geology of Mesozoic rocks from eastern Palmer Land, Antarctic Peninsula: crustal anatexis in arc-related granitoid genesis**, *Journal of South American earth sciences*, Jan. 1994, 7(1), p.69-83, Refs. p.82-83.

Rb-Sr and Sm-Nd analyses, as well as a few new K-Ar dates, are presented for plutonic igneous, meta-igneous and metasedimentary rocks from the central Black Coast area of eastern Palmer Land. Gneissic and foliated leucogranitoids, previously ascribed to a ?Precambrian/Paleozoic basement, yield Late Triassic to earliest Jurassic Rb-Sr isochron ages, with initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of up to 0.721. Isotopic comparison with local metasedimentary rocks suggests that the granitoids represent granite magmas that were generated, at least in part, by anatexis of similar metasediments at depth. Contemporaneous I-type granitoids have initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of 0.705-0.707. These cannot be distinguished from those of the subsequent mid-Cretaceous undeformed granitoids, which represent the climax of Andean subduction-related magmatism in this area. K-Ar ages on basaltic dikes record emplacement associated with late-stage block-faulting and uplift of the Cretaceous batholith at about 80 Ma. Triassic/Jurassic crustal anatexis is related to a period of reduced subduction within a plate margin regime that had been active during Paleozoic times. It corresponds to the earliest stages of lithospheric extension in the proto-Pacific margin of Gondwana, prior to mid-Jurassic formation of back-arc basins in the western Weddell Sea, and to Late Jurassic continental separation. (Auth. mod.)

E-50457

Soliani, E., Jr., Bonhomme, M.G., **New evidence for Cenozoic resetting of K-Ar ages in volcanic rocks of the northern portion of the Admiralty Bay, King George Island, Antarctica**, *Journal of South American earth sciences*, Jan. 1994, 7(1), p.85-94, 17 refs.

This paper presents six K-Ar whole-rock ages of the Znosko Glacier Formation (Cardozo Cove Group) that crops out between Mackellar Inlet (type-area) and Ezcurra Inlet, inner Admiralty Bay. Originally attributed to the Upper Mesozoic, a Rb-Sr isochron diagram places the lithostratigraphic unit in the Paleocene (60 +/- 5 Ma). The same samples were isotopically analyzed by the K-Ar method and the calculated ages, which range between 40 and 50 Ma, confirm the effect of an important tectonic-thermal event responsible for structural deformation and metasomatic alterations in that unit. The origin of the tectonic event and the related K-Ar reset on rocks cropping out around Admiralty Bay are discussed. (Auth. mod.)

E-50469

Gaździcki, A., Hara, U., **Multilamellar bryozoan colonies from the Eocene La Meseta Formation of Seymour Island, Antarctica: a preliminary account**, *Studia geologica polonica*, 1994, Vol. 104, p.105-116, 26 refs.

An assemblage of multilamellar, spheroidal cheilostome and cyclostome bryozoans has been found in the lower part of the Eocene La Meseta Formation near Cape Wiman on Seymour I. The cyclostomes form massive hemispherical colonies which are assigned to the genera *Ceriopora* Goldfuss 1827 and *Tetrocycloeccia* Canu 1919. The cheilostomatous anascan bryozoans are constructed as spheroidal, slightly oblate multilamellar colonies (the celleporiform A ectoproctoliths) composed of successive overgrowing layers. They are represented by the genera of the family Membraniporidae Busk, 1854. The zoarial growth form of the investigated multilamellar bryozoan colonies may indicate that these free-lying forms settled on a firm or loose substrate in tidal and deltaic sedimentary environments of the La Meseta Formation. This is the first record of such bryozoan biofacies from Antarctica. (Auth.)

E-50484

International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988, Ulbrich, H., ed, Rocha Campos, A.C., ed, **Gondwana Seven. Proceedings**, São Paulo, 1991, 714p., Refs. passim. For selected papers see E-50485 through E-50500.

DLC QE511.5.I54

This volume comprises 48 papers, of which 16 are pertinent to Antarctica, presented at the Seventh Gondwana Symposium held in São Paulo, July 18-22, 1988. Four general themes were addressed: crustal structure and early history of Gondwana cratonic areas, Gondwana basins, Gondwana biota and biostratigraphy, and finally Gondwana plate margins and fragmentation history.

E-50485

Spaeth, G., Fielitz, W., **Structural evolution of Western New Schwabenland and the Shackleton Range—a comparison**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. **Gondwana Seven. Proceedings**. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.3-18, Refs. p.12-14.

DLC QE511.5.I54

The structural history of western New Schwabenland, and a comparison between this region and the Shackleton Range, are presented. Similarities and distinct differences are discussed. The crystalline basement rocks are similar in metamorphic grade and are both covered by Precambrian and younger sedimentary sequences. Both areas show several generations of fold axes. Gently dipping overthrusts and nappe-like structures are present. Distinct differences exist in age and structures of the cover sequences, directions and vergences of folds and overthrusts. Basic dikes, which are common in western New Schwabenland, are limited in number in the Shackleton Range. The geotectonic setting and relations of both regions are discussed with respect to the Ross orogeny and its influence on the breakup of Gondwana. Both regions belong to the East Antarctic Craton but show strong influences due to the Late Precambrian-Early Paleozoic tectogenesis. The Shackleton Range is thought to be an orogen of its own, probably representing an aulacogen as an intracratonic branch of the Ross orogen. (Auth. mod.)

E-50486

Kleinschmidt, G., Braun, H.M., Buggisch, W., **Gondwana's Pacific margin during the Early Paleozoic: the Ross Orogen and its structure in the Shackleton Range and North Victoria Land (Antarctica)**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. **Gondwana Seven. Proceedings**. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.19-32, Refs. p.25-27.

DLC QE511.5.I54

First results from the geological expedition to the Shackleton Range in 1987-88 are presented and compared with earlier studies in northern Victoria Land. Fieldwork confirmed similarities of the main lithological units in both regions. In further analogy, most of the geological boundaries in the Shackleton Range proved to be thrust zones as well. The time of thrusting is assigned to the Ross Orogeny. While thrusting in northern Victoria Land was directed towards the Pacific Ocean, shear indicators in the Shackleton Range show transport towards the south. According to sedimentological investigations, this is the direction of the stable craton. In terms of the subduction model developed for northern Victoria Land, the whole Ross Orogen may be divided into 2 contrasting thrust belts: one directly related to subduction (northern Victoria Land), and a second belt further inland which may represent a foreland thrust belt (Shackleton Range). (Auth. mod.)

E-50487

Maslanyj, M.P., Storey, B.C., Smith, A.M., Jones, J.A., **Geophysical evidence for the boundaries and relationships between West Antarctic crustal blocks**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. **Gondwana Seven. Proceedings**. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.33-45, 19 refs.

DLC QE511.5.I54

Information from outcrop geology and sub-ice topography suggests that West Antarctica is composed of several crustal blocks, but the relationships between the blocks and the nature of the boundaries are uncertain. For these reasons, regional aeromagnetic, gravity and bedrock elevation data are examined where several blocks meet: Antarctic Peninsula, Thurston I., Haag Nunataks and the Ellsworth-Whitmore Mountains. The regional magnetic anomaly map is dominated by two major positive anomaly zones. The geophysical data suggest that the crustal blocks have some common structural features and overlapping geological histories. The Pacific Magnetic Anomaly Belt is common to both the Antarctic Peninsula and Thurston I., and Haag Precambrian basement may exist beneath part of the Weddell Sea Embayment and the Ellsworth Mountains. If deep source lineations beneath the Weddell Sea Embayment are related to Haag basement then the data would support block rotation Gondwana breakup models. Alternatively they may be imaging a Mesozoic breakup related process. (Auth. mod.)

E-50488

Isbell, J.L., Collinson, J.W., **Sedimentological significance of fluvial cycles in the Permian of the Central Transantarctic Mountains, Antarctica**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. **Gondwana Seven. Proceedings**. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.189-199, Refs. p.195-197.

DLC QE511.5.I54

Low-sinuosity braided streams deposited Permian sediments within the Transantarctic Foreland Basin. The fluvial sequence begins with the Fairchild Formation, a 230 m-thick multistoried sandstone. The overlying Buckley Formation is 750+ m thick and consists of interstratified sandstone, siltstone, shale and coal. Channel-form sandstone predominates at the base of the Buckley, while fine-grained inter-channel units increase in abundance and thickness upward. Sedimentological features of inter-channel members indicate that channel-belt avulsion occurred. Fluvial architecture of the formations resulted from the interaction between subsidence and channel avulsion. During Fairchild deposition, slow basin subsidence relative to avulsion preferentially preserved channel-form sandstones; fine-grained sediments were removed by floodplain scour during avulsion events. The progressive increase in floodplain deposits up the Buckley section resulted from an acceleration in subsidence rates. Evidence for increased rates of subsidence and changes in sandstone provenance and paleocurrent trends demonstrates migration of the basin axis toward the craton. Encroachment of a foreland fold/thrust belt is hypothesized as the driving mechanism for basin migration. (Auth.)

E-50489

Miller, M.F., Collinson, J.W., Frisch, R.A., **Depositional setting and history of Permian post-glacial black shale: Mackellar Formation, Central Transantarctic Mountains**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. **Gondwana Seven. Proceedings**. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.201-215, Refs. p.208-209.

DLC QE511.5.I54

Permian post-glacial black shales are distinctive components of Gondwana sequences and useful in regional correlations. Integrated study of these sequences, in this case the Mackellar Formation of the Beardmore Glacier area, can also provide detailed information about Permian paleogeography and depositional history. The Mackellar Formation accumulated in fresh to slightly brackish water, as indicated by presence of nonmarine trace fossils, absence of marine body and trace fossils, and high carbon/sulfur ratios. Connection to the paleo-Pacific Ocean, if any, was distant or obstructed. Deposition in this large proglacial lake was dominated by turbidity currents generated by introduction of cold, sediment-laden water from streams flowing southward across a broad braid plain. A complex mosaic of coalescing channel-levee complexes representing deltaic lobes filled the lake; hence the Mackellar Formation was an ancient delta-fed subaqueous fan system. Sands were derived from a northern cratonic source, probably granitic and metamorphic rocks now exposed in the Nimrod Glacier area. Total organic carbon content of the Mackellar Formation is less than 1% and mostly derived from terrestrial plants, consistent with a nonmarine origin. (Auth. mod.)

E-50490

Collinson, J.W., Miller, M.F., **Comparison of Lower Permian post-glacial black shale sequences in the Ellsworth and Transantarctic Mountains, Antarctica**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.217-231, Refs. p.225-228.

DLC QE511.5.I54

Lower Permian post-glacial black shales in the Ellsworth and central Transantarctic Mountains accumulated in an extensive inland sea. Significant differences in this unit across the region provide important clues toward interpreting Gondwanan paleogeography. The Polarstar Formation in the Ellsworth Mountains is compared with its counterpart, the Mackellar Formation in the central Transantarctic Mountains. The authors propose a paleogeographic model in which an inland sea occupied the elongate, rapidly subsiding Transantarctic Basin. This basin developed between the East Antarctic Craton and a volcanic arc along the paleo-Pacific margin. Marine connections were near the Ellsworth Mountains. Salinity decreased toward the narrow end of the basin in the Beardmore Glacier area. In this region the inland sea filled rapidly by coalescing submarine fans formed by the underflow of cold, sediment-laden water delivered by braided streams. (Auth. mod.)

E-50491

Elliot, D.H., Bigham, J., Jones, F.S., **Interbeds and weathering profiles in the Jurassic basalt sequence, Beardmore Glacier region, Antarctica**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.289-301, 22 refs.

DLC QE511.5.I54

Tholeiitic flood basalts cap the Gondwana sequence in the central Transantarctic Mountains, in two separate areas north and south of Beardmore Glacier. Stratigraphic sections are up to 520 m thick. The simple succession of lavas is interrupted by weathering profiles and a variety of interbeds. Weathering profiles, up to 1.5 m thick, consist of very fine grained structureless rock that overlies strongly altered amygdaloidal basalt. Widely dispersed amygdaloidal lava clasts occur nearly to the top of some profiles. The upper surfaces commonly carry plant impressions. In a few profiles, near vertical branching tubes are present; these profiles are interpreted as paleosols. The structureless rock consists of scattered quartz and less common plagioclase set in a quartzose and subordinate phyllosilicate matrix; tricusate shards are present in a few profiles. The profiles are interpreted to be the result of vertical mixing of silicic ash, laid down on already weathered basalt, by soil forming processes, possibly of the vertisol type. (Auth. mod.)

E-50492

Faure, G., Lord, B.K., **Oxygen and carbon isotope compositions of calcite in carbonate concentrations in the Beacon rocks of Antarctica: products of the Gondwana icesheet**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.303-315, 26 refs.

DLC QE511.5.I54

Calcites in concretionary carbonate beds of the Pagoda, Mackellar, Fairchild, Buckley and Fremouw Formations of the Queen Alexandra and Queen Elizabeth Ranges have $\delta^{18}\text{O}$ values between -19.1 and -29.1 per mill (PDB). The depletion in ^{18}O reflected by these values indicates that the calcites precipitated from ^{18}O -depleted water whose $\delta^{18}\text{O}$ value could have been about -30 per mill (SMOW), if precipitation occurred in isotopic equilibrium at 5 C. The carbon in some of these calcites is also strongly depleted in ^{13}C with $\delta^{13}\text{C}$ values between +2.7 and -17.9 per mill (PDB). These results, together with previously published data, suggest that the calcites were precipitated during diagenesis from water derived in large part by melting of the stagnant remnants of the Gondwana ice sheet which persisted into the Triassic period. (Auth.)

E-50493

Schlüter, T., **Fossil insect-bearing localities in Gondwana as indicators of paleogeographic relationships**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.425-438, Refs. p.432-435.

DLC QE511.5.I54

As inhabitants of terrestrial ecosystems, insects are quite reasonably adapted to indicate a paleogeographic development in Gondwana, especially during its initial fragmentation. Generally the origin and development of floral provincialism during Carboniferous and Permian in Gondwana has been accepted (*Glossopteris-flora*), but it has never been established whether the evolution of insects can be reconciled with floral provincialism. The likelihood of such trends is high due to the fact that many insects and plants are connected by coevolutionary relationships. It is the aim of this paper to present from the list of all known fossil insects of Gondwana a comparison of their phylogenetic development with those of Laurasia. Higher groups (extinct Palaeodictyoptera, Megasecoptera, Protodonata and Protorthoptera and extant Odonata, Plecoptera, Blattodea, Hemiptera, Mecoptera, Neuroptera and Coleoptera) are especially well-preserved in deposits of Upper Carboniferous, Permian and Triassic age, and some palaeogeographic conclusions can be drawn from their distribution pattern. (Auth. mod.)

E-50494

Trurnit, T.P., **Unorthodox fit between West and East Gondwana and a reassembly of Pangaea in the Southern Hemisphere**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.559-571, 23 refs.

DLC QE511.5.I54

The more recent history of the Earth appears to be subdivided into alternating North Pangaea growth/South Pangaea breakup eras (Permian to present-day Uralian-Indosinian-Kimmerian-Laramide-Alpine Cycle; Late Proterozoic Panafrican-Brasiliano Cycle) and South Pangaea growth/North Pangaea breakup eras (Late Proterozoic and Early to Middle Paleozoic Baikalian-Cadomian-Caledonian Cycle; Middle to Late Proterozoic Kibaran-Grenvillian-Uruçuano Cycle). In the hemisphere of the Pangaea breakup, the continents rotate through some 120 deg while passing through the Antarctica setting (clockwise in the Southern Hemisphere, counterclockwise in the Northern Hemisphere). Through reverse rotations of the South Pangaea continents (breaking up since the Permian in the Southern Hemisphere) to their Early Mesozoic and Paleozoic orientations, one arrives at the correct reassembly of Gondwana, South Pangaea and the two-lap South Pangaea collisional mountain belt spiral. (Auth. mod.)

E-50495

Tarling, D.H., **Gondwanan reconstructions for the Mesozoic and Late Paleozoic**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.573-587, 20 refs.

DLC QE511.5.I54

The outline of Gondwana during Paleozoic times is now generally accepted as being similar to that originally proposed by du Toit (1937), with the match of South America and Africa to form western Gondwana having been only slightly modified since the reconstructions of Carey (1958) and Bullard et al. (1965). Similarly, the fits of Antarctica to both Australia and India have only been changed in details that have not drastically altered the overall appearance of eastern Gondwana. An examination of the magnetic anomaly patterns in the Indian Ocean, combined with a re-assessment of the extent and location of continental fragments, suggests an alternate sequence of reconstructions for East and West Gondwana during the Mesozoic. These changes result in a somewhat simpler sequence of motions than previously supposed. The final reconstruction for mid-Jurassic and earlier times appears to be consistent with other geological and geophysical evidence. Mesozoic and Palaeozoic

palaeomagnetic evidence appears to be consistent with this model, but the available data are still inadequate for testing most reconstructions. (Auth. mod.)

E-50496

Powell, C. McA., Veevers, J.J., **Disruption of East Gondwana-land (Antarctica, Australia, India) by continental extension before seafloor spreading**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.589-601, Refs. p.594-596.

DLC QE511.5.I54

Australia and Antarctica occupied the eastern part of Gondwana until their breakup by the growth of the southeast Indian Ocean in the mid-Cretaceous (96 Ma). The growth of the ocean was preceded by a stage of separation of the land areas of the continents that started in the mid-Jurassic (160 Ma). This separation was effected by 360 km of extension (0.6 cm/a) by normal and listric faulting in a 600 km wide zone, represented today by the submerged continental margins. In the first phase of seafloor spreading, from the mid-Cretaceous to the Eocene (45 Ma), the southeast Indian Ocean grew to a width of 500 km at the slow rate of 0.9 cm/a, and in the second phase grew another 2600 km at a fast rate of 6 cm/a. From 160 Ma to 132.5 Ma (M-11), India-Australia rotated from Antarctica by continental extension between Australia and Antarctica, and by largely transform-fault motion between the southeastern margin of India and the conjugate margin of Antarctica. In the second stage from 132.5 to 96 Ma, when continental extension between Australia and Antarctica was greatest, India moved northwestward away from Australia/Antarctica, producing M-10 and younger magnetic anomalies and many bathymetric features off the western margin of Australia. (Auth. mod.)

E-50497

Mensing, T.M., Faure, G., Jones, L.M., Hoefs, J., **Stratigraphic correlation and magma evolution of the Kirkpatrick Basalt in the Mesa Range, northern Victoria Land, Antarctica**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.653-667, 15 refs.

DLC QE511.5.I54

The flows of the Kirkpatrick Basalt (Jurassic) in the Mesa Range of northern Victoria Land have been divided into two suites based on differences in their chemical compositions. The Lower Suite on Pain Mesa can be correlated with the flow sequence on nearby Solo Nunatak by reference to a prominent marker flow. As a result, the complete section includes more than 40 flows with a combined thickness of over 800 m. The initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of the Lower Suite on Pain Mesa correlate with the $\delta^{18}\text{O}$ values of the flows. This relationship was previously recognized for the flows on Solo Nunatak and was explained by fractional crystallization of magma and simultaneous assimilation of country rocks. The new results from Pain Mesa strengthen the evidence for crustal contamination of the Lower Suite of flows at both localities. (Auth.)

E-50498

Faure, G., et al, **Isotopic and geochemical studies of Ferrar Dolerite sills in the Transantarctic Mountains**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.669-684, Refs. p.676-678.

DLC QE511.5.I54

The average chemical compositions of 5 systematically sampled sills of the Ferrar Dolerite (Jurassic) at Roadend Nunatak and Mt. Acher-nar indicate enrichment in Fe_2O_3 (total Fe), TiO_2 , alkali metals, Sr, Ba and Zr with increasing SiO_2 and concurrent depletion in Al_2O_3 , CaO, MgO and Cr. Whole-rock Rb-Sr dates range from 182 Ma to 190 Ma with overlapping errors. The best estimate of the age of the sills is 186 Ma. The sills have significantly different initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios ranging from 0.70808 to 0.71167. The chemical and isotopic evidence indicates

that the sills formed from separate batches of magma that may have originated from reservoirs in which tholeiite basalt magma was evolving both chemically and isotopically. Rocks within several meters of the upper and lower contacts of the sills are depleted in ^{18}O , presumably by isotope exchange with an aqueous fluid at high subsolidus temperatures. Sills that intruded sandstones may have been altered throughout, whereas the chilled margin of the sill that intruded the granite basement was only slightly affected. (Auth.)

E-50499

Smellie, J.L., **Middle-Late Jurassic volcanism on Jason Peninsula, Antarctic Peninsula, and its relationship to the break-up of Gondwana**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.685-699, Refs. p.692-695.

DLC QE511.5.I54

The timing of volcanism on Jason Peninsula was coincident with the early stages of fragmentation of Gondwana during the Middle-Late Jurassic. Outcrops consist only of rhyolitic lavas and ignimbrites, and volumetrically minor basic sills and lavas. It is hard to ascribe an origin to the rhyolites because of their pervasive alteration, but they resemble classical “S-type” rocks in many respects. The generally fresher basic sills and lavas are unusual in showing compositional similarities to both tholeiitic and calc-alkaline magmas. Together, the rhyolites with the sills and lavas appear to comprise a bimodal magmatic association formed in a continental back-arc region undergoing extension. The petrogenesis of the Jason Peninsula rhyolites, sills and lavas is most easily reconciled with a model of Jurassic rifting which culminated in continental fragmentation. (Auth.)

E-50500

Milne, A.J., **Mid-Paleozoic magmatism along part of the Antarctic Peninsula segment of the Pacific margin of Gondwana**, International Gondwana Symposium, 7th, São Paulo, Brazil, July 18-22, 1988. Gondwana Seven. Proceedings. Edited by H. Ulbrich and A.C. Rocha Campos, São Paulo, 1991, p.701-714, Refs. p.707-709.

DLC QE511.5.I54

Recent geochronological studies of orthogneiss from the northern Antarctic Peninsula have yielded the first reliable mid-Palaeozoic ages representing times of emplacement of granitic plutons. The granitic protolith was intruded by basaltic dykes whose extrusive equivalents are represented by a banded gneiss domain with paragneiss intercalations. This complex was then deformed and metamorphosed to amphibolite facies during Carboniferous time prior to the onset of the “Andean” magmatic episode in the Triassic. The first geochemical analyses of mid-Palaeozoic magmatic rocks from the Antarctic Peninsula have been obtained. Geochemistry of some of the Palaeozoic granitic and basaltic lithologies is consistent with an active continental margin setting similar to the Mesozoic magmatic arc rocks. The geochemistry of one group of granites is characteristic of subduction-related plutonism. One group of amphibolites has a chemistry similar to N-type MORB, suggesting that extension in the mid-Palaeozoic magmatic arc was important. (Auth.)

E-50506

Van der Meer, J.J.M., Mücher, H.J., Höfle, H.C., **Micromorphological observations on till samples from the Shackleton Range and north Victoria Land, Antarctica**, *Polarforschung*, 1992 (Pub. 1993), 62(1), p.57-65, 20 refs.

A study of the micromorphological properties of glacial sediments, carried out on a small number of samples from north Victoria Land and Shackleton Range is described. Thin section analyses focussed on characterizing the samples by means of textural and structural composition and plasmic fabrics. In addition, post depositional features such as silt and clay illuviation and precipitation of iron and carbonates were studied. The 5 samples show a very strongly developed structure which relates to the periglacial rather than the glacial environment. This structure is best described as a pebble structure, consisting of rounded aggregates which exhibit a strong plasmic fabric, i.e. an internal orientation of fines. The latter is known as a latti-skelsepic plasmic fabric which is caused by rotational movement. All samples show evidence of translo-

cation of material, be it clay, silt, CaCO_3 or iron (hydr)oxides, indicating that (percolating) water and dispersion of clay play an important role in these sediments/soils. (Auth. mod.)

E-50513

Birkenmajer, K., **Jurassic terrestrial clastics (Mount Flora Formation) at Hope Bay, Trinity Peninsula (West Antarctica)**, *Polish Academy of Sciences. Bulletin. Earth sciences*, 1993, 41(1), p.23-38, 30 refs.

The 230-270 m thick Jurassic terrestrial clastic sequence of the Mount Flora Formation at Hope Bay is subdivided into an older Five Lakes Member (new unit: coarse sedimentary breccias, conglomerates, lag-concentrates and sandstones-170 m thick), and the upper Flora Glacier Member (new unit: sandstone-conglomerate complex 60-100 m thick, locally overlain by a shale complex up to 10 m thick). This is fining-upward alluvial fan-to-lacustrine sequence, laid down south of a high, probably fault-controlled morphological scarp built of metasediments of the Hope Bay Formation (?Permian, Trinity Peninsula Group). Angular unconformity and long stratigraphic hiatus separate the Mount Flora Formation from the underlying Hope Bay Formation. Angular unconformity divides the Mount Flora Formation from the overlying volcanics of the Kenney Glacier Formation stratocone (?Lower Cretaceous). (Auth.)

E-50514

Birkenmajer, K., **Succession of Cretaceous magmatic rocks at Paradise Harbour, Danco Coast (Antarctic Peninsula)**, *Polish Academy of Sciences. Bulletin. Earth sciences*, 1993, 41(1), p.39-48, 24 refs.

The magmatic rocks at Paradise Harbor are part of the Mesozoic magmatic arc of the Antarctic Peninsula. The oldest are the Early Cretaceous basaltic lavas and agglomerates with subordinate rhyodacite lava intercalations (Antarctic Peninsula Volcanic Group, APVG), altogether about 2000 m thick. The APVG pile is intruded by granite, granodiorite, diorite and gabbro plutons (Andean Intrusive Suite, AIS-1). Acidic, intermediate and basic hypabyssal dykes (AIS-2) cut through the effusive pile (APVG) and the plutonic intrusions (AIS-1). Slight folding affected the lava pile already during mid-Cretaceous. Stronger folding, faulting and SE-vergent thrusting which involve the whole succession (APVG, AIS-1,2) could be an expression of the oceanic Aluk Ridge/Antarctic Peninsula Magmatic Arc collision in a sector between the Tula and the Anvers Fracture zones during the Miocene. (Auth.)

E-50515

Birkenmajer, K., **Geology of Late Mesozoic magmatic rocks at Hope Bay, Trinity Peninsula (West Antarctica)**, *Polish Academy of Sciences. Bulletin. Earth sciences*, 1993, 41(1), p.49-62, 30 refs.

The Late Mesozoic magmatic rocks at Hope Bay, Trinity Peninsula are represented by the acidic terrestrial effusive complex of the Kenney Glacier Formation (rhyolite-dacite lavas, ignimbrites, tuffs and agglomerates)—basal unit of the Antarctic Peninsula Volcanic Group (APVG), and supposedly related leucocratic dykes and sills, by gabbro and diorite plutons of the Andean Intrusive Suite (AIS-1), and by melanocratic (basic to intermediate) dykes (AIS-2) post-dating the Kenney Glacier Formation and the Andean plutons. (Auth.)

E-50548

Brambati, A., Fanzutti, G.P., **Results of the oceanographic geologic expedition in 1987-1988** [Primi risultati della spedizione di oceanografia geologica in Antartide nell'estate australe 1987-1988], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.565-571, In Italian with English summary. 4 refs.

The study of a number of coastal areas allowed the identification of some of the geomorphological and lithological features of the Quaternary raised beaches of northern Victoria Land. In 5 lakes and one small lagoon NaCl content is very variable, as is the suspended matter in different water bodies. Bottom and nearshore belt sediments are scarcely differentiated. The onshore area between the Drygalski Basin and the coastline is a zone with a thin Holocene sedimentary cover. An outcrop of stratified rocks, regarded as metamorphites, was identified. The area between Cape Washington and Cape Russell appears to be shaped by tectonic and volcanic phenomena of recent origin. Grab samples of bottom sediments were collected in Terra Nova Bay and on the continental shelf of the western Ross Sea. They were analyzed for their textural, mineralogical and geochemical characteristics, leading to a distinction between the inner and outer shelves. Studies of siliceous assemblages of the sediments indicate diatoms, sponge spicules, silicoflagellates and fragmented radiolarians. Sediment accumulation rates for the area range from 0.03 to 0.15 g/cm²yr and Pb-210 fluxes from 0.32 to 0.51 dpm/cm²yr. Levels of biogenic silica and organic carbon have been determined in surface sediments and their respective budgets assessed. (Auth. mod.)

E-50549

Frignani, M., Langone, L., Ragaglia, L., Ravaioli, M., **Organic matter and biogenic silica in bottom sediments of the western Ross Sea (Antarctica)**, Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.573-582, 18 refs.

Analysis of 29 samples of superficial sediments collected in the Ross Sea during the Italian Antarctic Expedition of 1987-1988 is reported. Data on biogenic silica content and organic C and N are discussed and presented in tables and graphs. C/N and C/Si ratios provide information on fluxes and decomposition rates of organic matter. It is concluded that box core sampling was perhaps inaccurate, and that a more complete profile would yield a higher Co value than that obtained in this investigation.

E-50589

Wilsher, W., et al, **Towards intelligent spatial computing for the Earth sciences in South Africa**, *South African journal of science*, July 1993, 89(7), p.315-323, 35 refs.

The last two decades have seen the geological sciences branch out into more and more specialized subdisciplines. Modern computer graphics technology and interactive data-base handling heralds a new time for reintegration. At the University of Cape Town, there has been recently established a computer center which capitalizes on the advancing technology of geographical information systems (GIS). Fundamental to success is the ability to integrate information digitally from the different subdisciplines, to attain a synthesis that was previously impossible, notably with reference to the ancient supercontinent of Gondwana, and the mineral deposits of Antarctica. Now research at the center is able to solve diverse problems ranging from the global to the small-scale and from the academic to the applied. (Auth.)

E-50599

Kleinrock, M.C., Bird, R.T., **Southeastern boundary of the Juan Fernandez microplate: braking microplate rotation and deforming the antarctic plate**, *Journal of geophysical research*, May 10, 1994, 99(B5), p.9237-9261, Refs. p.9260-9261.

Data from a 1991 multibeam sidescan sonar, and geophysical survey of the Juan Fernandez microplate at the Pacific-Nazca-Antarctic triple junction strongly support a model of edge-driven microplate rotation. They reveal the nature of the microplate's southeastern boundary with the antarctic plate and show that plate boundary interactions are capable of significantly altering plate motions. Microplate rotation slowed progressively from >30 deg/m.y. to <10 deg/m.y. between Anomaly 2 time (1.9 Ma) and the early Brunhes (0.6 Ma). Magnetics, bathymetry, and

morphology suggest that this deceleration resulted from coupling across a rapidly evolving Juan Fernandez-Antarctic (JF-A) plate boundary. Over the past 2 m.y., the JF-A plate boundary has lengthened, changed orientation, and migrated to the southeast, into the antarctic plate. This process deformed and transferred to the Juan Fernandez plate about 3000 km² of the antarctic plate. (Auth. mod.)

E-50602

Bart, P., **Glacial and tectonic development of the Antarctic Peninsula**, Houston, Rice University, 1993, 119p., M.A. thesis. Refs. p.110-119.

The study area includes the Pacific-Antarctic continental shelf between Marguerite Bay and Bransfield Strait. Approximately 3500 km of intermediate resolution seismic data were collected during 1988 and 1990. The primary objective of this study is to determine the nature of ice sheet erosion and deposition on the continental shelf and to use these observations to reconstruct the glacial history of the region. In this unique tectonic setting, forearc regions underwent compression and vertical uplift during the convergence and collision of the Aluk-Antarctic spreading center and Antarctic Peninsula plate, causing the development of collision-related unconformities whose ages are derived from paleomagnetic data from the adjacent ocean floor. The study identified tectonic unconformities associated with collision events at 19.8 Ma, 16.5 Ma, 14.5 Ma, 10 Ma, 6 Ma and 4 Ma. The surfaces provide the chronostratigraphic framework for interpreting the age of glacial features on the shelf. Seismic stratigraphic analysis of the outer-shelf stratigraphic wedge demonstrates a history of dynamic ice sheet expansion and contraction that has continued to the Recent. A total of 31 major glacial units (i.e., glacial cycles) were identified. Ten cycles occurred in the middle Miocene and 21 have occurred since the late Miocene. (Auth. mod.)

E-50603

Pope, P.G., **Late Quaternary glacial history of the northern Antarctic Peninsula: evidence from the Bellingshausen continental shelf**, Houston, Rice University, 1991, 248p., M.A. thesis. Refs. p.147-153.

Studies of glacial and glacial marine sediments and sea floor morphology on the antarctic continental shelf have resulted in the reconstruction of maximum glacial conditions at several different locations near the antarctic continental margin. Attention has only recently been directed towards the Antarctic Peninsula's continental shelf. Glaciologists and glacial geologists have modeled, mathematically, the behavior of the Antarctic Peninsula Ice Sheet during a glacial maximum and through a complete interglacial to interglacial cycle. These models predict that during a glacial maximum, the Palmer Peninsula region, as well as portions of the western continental shelf, would be occupied by significant thicknesses of grounded glacial ice. The purpose of this study is to examine the sedimentological record from the portion of the western continental shelf between 63 and 67S in order to test these models. Indirect evidence suggests a major grounding event on the continental shelf, although until direct evidence, i.e. basal till, is recovered from the outer continental shelf of the Antarctic Peninsula, it is suggested that this significance must be minimized. (Auth. mod.)

E-50604

Banfield, L.A., **Seismic facies investigation of the Late Cenozoic glacial history of Bransfield Basin, Antarctica**, Houston, Rice University, 1994, 184p., M.A. thesis. Refs. p.171-184.

Approximately 3,000 km of high and intermediate resolution seismic data and 117 sediment cores were examined to reconstruct the Late Cenozoic glacial history of Bransfield Basin. Investigation of the seismic facies resulted in characterization and mapping of glacial sub-environments leading to the construction of a subpolar depositional model for glacial-interglacial cycles. In addition, these results help constrain Pleistocene climatic conditions. As seismic facies analysis indicates no significant meltwater activity, it is suggested that temperate deglacial-interglacial conditions did not exist in Bransfield Basin during the time interval studied (Pleistocene? to present). Another outcome of this study was a 13,000-14,000 yr BP minimum age for the end of the last significant glacial period with >800 m of ice grounded in >600 m of water. Examination of the data and application of the depositional model led to identification of key sites for shallow and deep drilling to further resolve questions of timing and paleoclimate. (Auth. mod.)

E-50635

International Conference on Environmental Radioactivity in the Arctic and Antarctic, Kirkenes, Norway, Aug. 23-27, 1993, Strand, P., ed, Holm, E., ed, **Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic, Kirkenes, Norway, 23-27 August 1993**, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, 433p., Refs. passim. For selected papers see 48-4511 through 48-4566 and E-50637, E-50639 through E-50641, F-50636, F-50644, F-50645, I-50638, I-50642 and J-50643.

The central theme of this conference is the transport and flux of radioactive elements, natural and anthropogenic, through atmospheric, terrestrial and marine environments in polar regions. Ten papers dealing with environmental radioactivity studies in Antarctica are included. (Auth. mod.)

E-50637

Tubertini, O., et al, **Italian Antarctic research program: environmental radioactivity survey around the Italian base (1987-1991) Terra Nova Bay—Ross Sea region**, Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic, Kirkenes, Norway, Aug. 23-27, 1993. Edited by P. Strand and E. Holm, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, p.195-199, 15 refs.

The activity of natural radionuclides in Terra Nova Bay are of the same order of magnitude as the average values for rocks of different origin. They therefore reflect the worldwide distribution of these elements which are homogeneously distributed over the earth crust. The ¹³⁷Cs data so far collected have indicated a very low global level of environmental impact from anthropogenic radioactivity, so that some of the measurements were carried out almost at the threshold of instrumental detection. The good agreement between the authors' data and that reported in literature for other areas of the antarctic continent suggested that both the fallout distribution and soil properties are fairly homogeneous all over Antarctica. (Auth. mod.)

E-50639

Schuller, P., Ellies, A., Vega, M., **¹³⁷Cs areal concentration in two sites in the Southern Shetland Islands**, Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic, Kirkenes, Norway, Aug. 23-27, 1993. Edited by P. Strand and E. Holm, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, p.207-209, 5 refs.

The ¹³⁷Cs areal concentrations determined for two sites in the South Shetland Is. are higher than the estimated cumulative deposition density for the corresponding latitude. This could be attributed to the input of foreign waters from surrounding areas. The ¹³⁷Cs areal concentration decreases exponentially with depth at each horizon. The relaxation depths depend primarily on the possibility of downward water movement. Such movement is possible in the melting periods and is conditioned by edaphic factors. (Auth.)

E-50640

Schuch, L.A., et al, **Radioactivity levels in antarctic samples**, Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic, Kirkenes, Norway, Aug. 23-27, 1993. Edited by P. Strand and E. Holm, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, p.211-214, 9 refs.

Soil, lichen moss and alga samples were collected in Dec.-Jan. 1986, 1988 and 1992 in King George Is., between the Brazilian station Comandante Ferraz and the Polish station Henryk Arctowski. Additionally, during summer 1988 lichen, moss and soil samples were collected

near the Brazilian sites at Elephant and Nelson Islands and in the campsite at Dee I. Thermoluminescent dosimeters (CoSO_4 and LIF) were installed at these locations and at Greenwich I., 1 m above the soil surface. ^{137}Cs concentration in soils of several of the South Shetland Is. was found to be high. The ^{137}Cs content in sediments from Admiralty Bay inlets and fields were quite similar to those in the King George I. soils. (Auth. mod.)

E-50641

Baciu, F., **Environmental radioactivity measurements in Wilkes Land, Eastern Antarctica, 1991**, Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic, Kirkenes, Norway, Aug. 23-27, 1993. Edited by P. Strand and E. Holm, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, p.215-219, 7 refs.

This paper presents results of natural and artificial radioactivity measurements in various components of the environment. The investigated area is the Windmill Is. area of Budd Coast, Wilkes Land, East Antarctica. Low levels of natural radioactivity were encountered. Anthropogenic radioactivity was detected, in particular the fission product ^{137}Cs . (Auth.)

E-50668

Goldstrand, P.M., et al, **Stratigraphic evidence for the Ross orogeny in the Ellsworth Mountains, West Antarctica: implication for the evolution of the paleo-Pacific margin of Gondwana**, *Geology*, May 1994, 22(5), p.427-430, 27 refs.

Early Paleozoic crustal deformation has been recognized along the paleo-Pacific margin of Gondwana, including southern Africa (Saldanian tectonism) and the Transantarctic Mountains of East Antarctica (Ross orogeny). Previously, no stratigraphic evidence for the Ross orogeny had been recognized within the Ellsworth Mountains of West Antarctica, believed to have been contiguous with the Transantarctic Mountains prior to the Mesozoic breakup of Gondwana. A disconformity between Middle to Upper Cambrian Heritage Group and Upper Cambrian to Devonian Crashesite Group strata indicates that the Ross orogeny did affect the Ellsworth Mountains, providing additional evidence that these rocks were once part of East Antarctica. Elsewhere in the Ellsworth Mountains, the disconformity is expressed by an abrupt change from shallow carbonate-platform deposits to siliciclastic shelf deposits. Similarities in lower Paleozoic stratigraphy among the Ellsworth Mountains, parts of the Pensacola Mountains (East Antarctica), and eastern South Africa imply that these regions were inboard of the zone of deformation that affected the proto-Pacific margin of Gondwana during the Ross orogeny and Saldanian tectonism. (Auth. mod.)

E-50672

Tatur, A., et al, **Surface mineralization on Seymour Island, Antarctica**, *Polish polar research*, Dec. 1993, 14(2), p.153-168, Refs. p.166-167.

Mineral composition of the bedrock is the main factor determining salt mineralization in the weathering zone of Seymour I. Supply of salts by sea water spray can accelerate the weathering process, modify chemical formula of salt minerals and give ephemeral efflorescences of easy soluble chlorides and partially longer lasting gypsum on the surface. Microbiologically mediated oxidation of sulphides, followed by acid sulphate drainage, formed K and Na jarosite, basic amorphous aluminum sulphate, gypsum, aluminum bearing ferrihydrite and ankerite in the weathering zone of Paleogene sediments. Intense alteration of well-lithified calcareous sandstones of unit 1 of the López de Bertodano Formation (Cretaceous) on the erosion surface led to surface mineralization comparable with that found on the continent. Stones on the surface are covered by a thin red film of ferrihydrite above the soil level and by a light green crust of aragonite colored by glauconite pigment on the underground side. Most of the Cretaceous sediment does not contain sulphides nor alteration-susceptible silicates. (Auth. mod.)

E-50683

Vilaplana, J.M., Pallàs, R., Calvet, J., **Geomorphology of Cape Shirreff, Livingston I.** [Geomorfología de la península del

Cabo Shirreff. Isla Livingston. Shetland del Sur. Antártida], *Geogaceta*, Dec. 1993, No.14, p.52-54, In Spanish with English summary. 8 refs.

The geomorphological exploration and mapping of the Cape Shirreff area was carried out during the 1992-93 Spanish Antarctic Expedition to Livingston I. In this area, two main systems of landforms were recognized: marine landforms, mostly comprised of three groups of raised platforms and five levels of raised beaches; and glacial landforms, conformed by recent moraines related to the present ice-margin and by older glacial deposits located on different marine levels. These landforms and the relationships between them allow the authors to reconstruct the recent deglaciation of this uplift controlled area. (Auth.)

E-50695

Taylor, T.N., Del Fueyo, G.M., Taylor, E.L., **Permineralized seed fern cupules from the Triassic of Antarctica: implications for cupule and carpel evolution**, *American journal of botany*, June 1994, 81(6), p.666-677, Refs. p.676-677.

The first anatomically preserved Mesozoic seed fern cupule, *Petriellaea*, is described. The multiovulate cupules were produced singly at the end of a short dichotomizing axis. Cupules are bilateral with a dorsal groove and transverse narrow ventral opening. The vascular system of the cupule consists of a series of traces that extend up the dorsal surface of the cupule and down the ventral face. Ovules are orthotropous, sessile, and borne on the adaxial surface of the leaflike cupule either singly or in multiple rows. Ovules are interpreted as being fossilized at a prepollination stage, although a few possess some evidence of a cellularized megagametophyte. These permineralized cupules indicate that in at least one Mesozoic seed fern group, ovule enclosure resulted from the transverse folding (tip to petiole) of a megasporophyll bearing adaxial ovules. Cupule morphology and ovule enclosure in other Late Paleozoic and Mesozoic seed ferns is discussed. (Auth. mod.)

E-50705

Miyamoto, M., Takeda, H., **Thermal history of lodranites Yamato 74357 and MAC88177 as inferred from the chemical zoning of pyroxene and olivine**, *Journal of geophysical research*, Mar. 25, 1994, 99(E3), p.5669-5677, Refs. p.5676-5677.

The chemical zoning profiles of pyroxene and olivine in the Yamato (Y) 74357 and MacAlpine Hills (MAC) 88177 acapulcoite-lodranite primitive achondrites were measured by using an electron probe microanalyzer in order to study their cooling histories. The reverse zoning of Fe and Mg, and MnO enrichment were observed within a few tens of microns from the rim of orthopyroxene in Y74357; this is probably related to reduction. The CaO of orthopyroxene in Y74357 and MAC88177 decreased gradually toward the rim, as do the Cr_2O_3 , Al_2O_3 , TiO_2 , and Na_2O in orthopyroxene and augite. These results suggest that interstitial melt was present and was then extracted at a late stage in the formation of these antarctic meteorites. In addition to these observations, the absence of Fe-Mg reverse zoning and MnO enrichment at the rim of MAC88177 orthopyroxene implies that the reduction process of Y74357 took place after partial melting. (Auth. mod.)

E-50713

Strait, M.M., **Movement of trace elements during residence in the antarctic ice: a laboratory simulation**, *U.S. National Aeronautics and Space Administration. Contractor report*, Dec. 1992, NASA-CR-185670, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program—1991. Vol.2, p.25/1-25/15, N92-21300, 18 refs.

Recent work has determined that differences in the trace element distribution between antarctic eucrites and non-antarctic eucrites may be due to weathering during residence in the ice; samples that demonstrate trace element disturbances do not necessarily correspond to eucrites that appear badly weathered to the naked eye. This study constitutes a preliminary test of the idea that long-term residence in the ice is the cause of the trace element disturbances observed in the eucrites. Samples of a non-antarctic eucrite were leached in water at room temperature conditions. Liquid samples were analyzed for rare earth element abundances using ion chromatography. The results for the short-term study showed

little or no evidence that leaching had occurred. However, there were hints that something may be happening. The residual solid samples are currently being analyzed for the unleached trace metals using instrumental neutron activation analysis, and should show evidence of disturbance if the chromatography clues were real. In addition, another set of samples continues to be intermittently sampled for later analysis. (Auth. mod.)

E-50718

Mussett, A.E., Taylor, G.K., ⁴⁰Ar-³⁹Ar ages for dykes from the Falkland Islands with implications for the breakup of southern Gondwanaland, *Journal of the Geological Society*, Jan. 1994, 151(1), p.79-81, 20 refs.

⁴⁰Ar-³⁹Ar incremental-heating spectra analyses were made of five microgabbro dykes from the Falkland Is., two of which yielded an acceptable plateau, and a third a close maximum estimate. All three indicate an age of dyke intrusion of about 190 Ma, supporting a single published K-Ar date. This provides further support for the geological continuity of the Falkland Is. and the eastern Karoo Basin where dyke swarms of similar petrological affinities were intruded at about the same time. The age confirms the previously published palaeoreconstruction of the Falkland Is., based on palaeomagnetic data placing the Falklands immediately to the east of southern Africa, to be valid until at least the late Early Jurassic. (Auth.)

E-50720

Storey, B.C., Pankhurst, R.J., Johnson, A.C., Grenville province within Antarctica: a test of the SWEAT hypothesis, *Journal of the Geological Society*, Jan. 1994, 151(1), p.1-4, 20 refs.

Geochronological, isotopic and aeromagnetic data, including a new Rb-Sr isochron of 1076 Ma for volcanic rocks at Bertrab Nunatak, Coats Land, confirm the existence of rocks of Grenvillian age within both East and West Antarctica and support the juxtaposition of Antarctica and western North America in Neoproterozoic reconstructions. (Auth.)

E-50726

Behrendt, J.C., et al, CASERTZ aeromagnetic data reveal late Cenozoic flood basalts(?) in the West Antarctic rift system, *Geology*, June 1994, 22(6), p.527-530, 27 refs.

The late Cenozoic volcanic and tectonic activity of the enigmatic West Antarctic rift system has been suggested to be plume driven. In 1991-1992, as part of the CASERTZ (Corridor Aerogeophysics of the Southeast Ross Transect Zone) program, a 25,000 km aeromagnetic survey over the ice-covered Byrd subglacial basin shows magnetic "texture" critical to interpretations of the underlying extended volcanic terrane. The aeromagnetic data reveal numerous semicircular anomalies about 100-1100 nT in amplitude, interpreted as having volcanic sources at the base of the ice sheet; they are concentrated along north-trending magnetic lineations interpreted as rift fabric. Models constrained by coincident radar ice soundings indicate highly magnetic sources, with a probable high remanent magnetization in the present field direction, strongly suggesting a late Cenozoic age. Magnetic anomalies over exposed late Cenozoic volcanic rocks along part of the rift shoulder and in coastal Marie Byrd Land are similar in form and amplitude. The CASERTZ aeromagnetic results, combined with >100,000 km of widely spaced aeromagnetic profiles, indicate at least 10⁶ km³ of probable late Cenozoic volcanic rock (flood basalt?) in the West Antarctic rift beneath the ice sheet and Ross Ice Shelf. (Auth. mod.)

E-50729

Kallemeyn, G.W., Rubin, A.E., Wasson, J.T., Compositional classification of chondrites: VI. The CR carbonaceous chondrite group, *Geochimica et cosmochimica acta*, July 1994, 58(13), p.2873-2888, Refs. p.2886-2888.

New analytical data combined with recent studies by other researchers allow the definition of a Renazzo (CR) group of carbonaceous chondrites. The authors analyzed nine CR chondrites including 6 from Antarctica (Acfer 187, Acfer 209, El Djouf 001, Elephant Moraine 87747, Elephant Moraine 87770, Elephant Moraine 87847, MacAlpine Hills 87320, PCA91082, and Yamato 793495) constituting at least 5 independent fall events by instrumental neutron activation analysis for

twenty-seven elements. Along with previously analyzed Renazzo, 6 or more closely related fall events are represented. The CR chondrites experienced some reduction during weak thermal metamorphism; the heating must have taken place prior to hydrothermal alteration. It is suggested that formation of magnetic (and framboidal magnetite in particular) in CI and CR chondrites is due to hydrothermal alteration of metal-rich (or opaque-rich) precursors, and that the low abundance of magnetite in CM chondrites relative to CI indicates that the CM precursors were metal poor. Some carbonates in CI and CR chondrites may have formed by H₂O reaction with cohenite or poorly crystallized graphite. (Auth. mod.)

E-50730

McKay, G., Le, L., Wagstaff, J., Crozaz, G., Experimental partitioning of rare earth elements and strontium: constraints on petrogenesis and redox conditions during crystallization of antarctic angrite Lewis Cliff 86010, *Geochimica et cosmochimica acta*, July 1994, 58(13), p.2911-2919, 35 refs.

The partitioning of REE and Sr among anorthite, fassaitic pyroxene, and synthetic melts similar in bulk composition to antarctic angrite LEW 86010 was studied experimentally at 1 atm and 1175-1210 C using the percent level doping technique. Most experiments were at an oxygen fugacity 1 log unit above the iron-wüstite buffer, but Eu and Gd partitioning were studied from iron-wüstite to just above quartz-fayalite-magnetite. Pyroxene partition coefficients are correlated with Al content of the pyroxene. Despite the fassaitic nature of the synthetic pyroxenes, partition coefficients are not dramatically different from those for diopside. Parent melts calculated by inverting natural pyroxene and anorthite cores from LEW 86010 using partition coefficients from this study are in excellent agreement with one another. This agreement is strong evidence for equilibrium between the natural mineral cores at the time the meteorite crystallized, and lack of subsequent subsolidus diffusive modification of REE abundances in the cores. The overall levels of the computed REE patterns agree well with REE abundances in bulk samples of LEW 86010, supporting the idea that this sample formed through a process approximately closed-system fractional crystallization. Results indicate crystallization at about 1 log unit above iron-wüstite, considerably more oxidizing than conditions under which common basaltic achondrites such as eucrites are thought to have formed. (Auth. mod.)

E-50731

Veevers, J.J., Case for the Gamburtsev Subglacial Mountains of East Antarctica originating by mid-Carboniferous shortening of an intracratonic basin, *Geology*, July 1994, 22(7), p.593-596, 39 refs.

The present drainage of East Antarctica, with ice radiating from a central dome draped over the thick crust of the Gamburtsev Subglacial Mountains, recapitulates the Early Permian scene, including the south polar paleolatitude. The Permian radial drainage was on the same scale as the present drainage around the thick crust of the Tibetan Plateau. Another high region in Carboniferous-Permian time was the upland of Europe on crust thickened during the Variscan collision to form Pangea. The ancestral Gamburtsev Subglacial Mountains and a central Australian upland may have formed because of long-distance stress from the Variscan collision acting on zones of weak crust attenuated during prolonged subsidence of intracratonic basins. The mid-Carboniferous inception of widespread glaciation was possibly linked with vast uplands in northern and southern Pangea through the effects of Variscan topography and the removal of atmospheric CO₂ during accelerated erosion and weathering. (Auth.)

E-50732

Barker, D.H.N., Austin, J.A., Jr., Crustal diapirism in Bransfield Strait, West Antarctica: evidence for distributed extension in marginal-basin formation, *Geology*, July 1994, 22(7), p.657-660, 20 refs.

New multichannel seismic data from Bransfield Strait image complex fan-shaped faulting patterns along the Antarctic Peninsula margin. Although a neovolcanic zone running along the strait's axis has been presumed to be a nascent spreading center and the primary focus for extension, the fan-shaped faulting pattern can be interpreted instead as evidence for intracrustal diapirism, suggesting separate diffuse zones of

extension. Furthermore, the diapiric trend about 5 deg divergent from that of the neovolcanic zone supports temporal and spatial evolution of stress, perhaps in response to complex plate interactions to the northeast. (Auth.)

E-50733

Behrendt, J.C., Cooper, A.K., **Minimal Pliocene-Pleistocene uplift of the dry valleys sector of the Transantarctic Mountains: a key parameter in ice-sheet reconstruction. Comment and reply**, *Geology*, July 1994, 22(7), p.668-670, 17 refs.

In the comment, Behrendt et al. state that Wilch et al. (1993) challenged the hypothesis of Behrendt and Cooper (1991) that the shoulder escarpment of the West Antarctic rift system (partly in the Transantarctic Mountains) has episodic differential uplift rates as great as about 1 km/m.y. in crustal blocks containing the highest peaks (but not the dry valleys), since Pliocene time, and that they also challenged the speculation that uplift of the rift shoulder may have forced the climatic changes that led to one or more of the advances of the antarctic ice sheet. In the reply, Wilch et al. agree with Behrendt and Cooper that the Transantarctic Mountains consist of many tectonic blocks that were probably uplifted episodically, but the present authors disagree that an episode of rapid widespread surface uplift occurred in Pliocene-Pleistocene time. This disagreement bears on the suggestion that rapid uplift beginning 2-5 m.y.a. caused a climatic change from temperate to polar conditions in Antarctica at 2.5 Ma.

E-50738

Seitz, H.M., **Estimation of emplacement pressure for 2350 Ma high-Mg tholeiite dykes, Vestfold Hills, Antarctica**, *Euro-pean journal of mineralogy*, Mar.-Apr. 1994, 6(2), p.195-208, Refs. p.207-208.

Emplacement pressures of the 2350 Ma old high-Mg tholeiite dyke suite in the Vestfold Hills block have been previously estimated to be 7-8 kbar. New data suggest that these estimates are too high. The depth of emplacement has been estimated using two different approaches: geobarometry based on aluminum exchange between clinopyroxene and plagioclase, and examination of high pressure liquidus mineralogy of the high-Mg tholeiites. Geobarometry applied to groundmass assemblages (clinopyroxene+plagioclase) indicates across-dyke variations. It is inferred that pressure estimates from the dyke interior (1 to max. 5 kbar) represent the ambient emplacement pressures, whereas pressure estimates derived from phenocryst assemblages (ol+opx) in chilled margins may represent crystallization pressures prior to dyke emplacement. The results suggest a much shallower emplacement depth (1-max. 5 kbar) of the 2350 Ma old tholeiites than previously thought (7-8 kbar). (Auth. mod.)

E-50746

Baeza, A., et al, **Radioactive concentrations of the Livingston Island soils (Antarctica). Dosimetry considerations**, *Applied radiation and isotopes*, June 1994, 45(6), p.675-681, 22 refs.

The radioactive concentrations of natural and man-made (^{90}Sr and ^{137}Cs) emitters were studied in soil samples collected from an area of 2.3 km² around the Spanish antarctic base on Livingston I. in the South Shetlands. The levels of radiation detected for natural radioisotopes, as well as the measured levels of effective dose equivalent rate, are of the order of half the values commonly assigned as world averages for these magnitudes. (Auth.)

E-50748

Holmlund, P., Näslund, J.O., **Glacially sculptured landscape in Dronning Maud Land, Antarctica, formed by wet-based mountain glaciation and not by the present ice sheet**, *Boreas*, June 1994, 23(2), p.139-148, 42 refs.

The glacial landscape beneath the Maudheimvidda ice sheet in East Antarctica was most probably formed during a more temperate phase of antarctic glaciation than the present. Overdeepened glacial cirques and U-shaped valleys are found in the Heimefrontfjella and Vestfjella mountain ranges. These glacial landforms, located beneath the ice sheet, have been mapped with radio-echo sounders. The present ice sheet covering these landforms is cold and frozen to its bed, and has a negligible erosive effect on the substrate. Ice sheet thickening during the Quaternary gla-

cial periods is not believed to have caused any significant increase in erosion at the investigated sites. Instead, the glacial morphology was most likely formed by smaller temperate glaciers when the antarctic climate was warmer than at present. Datings of foraminifera and ash layers from the Transantarctic Mountains indicate that the present cold ice sheet was formed 2.5 Ma. Other studies imply that a cold antarctic ice sheet has lasted even longer. The glacial landforms in Maudheimvidda may thus be of a pre-Quaternary age. (Auth. mod.)

E-50766

Ricci, C.A., ed, Meeting, Earth Sciences in Antarctica, 4th, Siena, Feb. 3-5, 1993, **Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes**, *Terra Antarctica*, 1994, 1(1), 233p., Refs. passim. For individual papers see A-50816, C-50791, E-50767 through E-50790, E-50792 through E-50798, E-50800 through E-50805, E-50812 through E-50815, F-50799 and L-50806 through L-50811.

This first issue of Terra Antarctica consists mainly of the proceedings of the Italian Antarctic Earth Sciences 4th meeting held in Siena, Feb. 3-5, 1993. The papers, presented as oral and poster communications, are reported here as articles, short notes, and abstracts. They are grouped according to 5 thematic sections, two of which deal largely with lithospheric investigations in the Ross Sea, while the other three cover marine geological and geophysical investigations, glacial geology, and seismic observations. Data acquired by the geomagnetic observatory at Terra Nova Bay during the summer of 1990-1991 are included. The volume concludes with outlines of 5 antarctic projects of the International Cooperative Programmes.

E-50767

Palmeri, R., Pertusati, P.C., Ricci, C.A., Talarico, F., **Late Proterozoic(?) - Early Paleozoic evolution of the active Pacific margin of Gondwana: evidence from the southern Wilson Terrane (northern Victoria Land, Antarctica)**, *Terra Antarctica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.5-9, 37 refs.

Existing geological, petrological and geochemical data are discussed from the southern Wilson Terrane, the nearest unit of northern Victoria Land to the East Antarctic Craton. These data consistently support the view that this part of Antarctica has constituted an active margin since the late Proterozoic(?) - Early Paleozoic. The depicted thermomechanical evolution of southern Wilson Terrane may be comprehensively included in the Ross orogeny. This implies that the postulated rifting process related to the separation of western Laurentia from East Antarctica must be older than Late Proterozoic(?) - Early Paleozoic. (Auth.)

E-50768

Borghi, A., Lombardo, B., **Petrological evidence of mono- and poly-metamorphic complexes in the Gerlache Inlet-Black Ridge high-grade belt (Wilson Terrane, northern Victoria Land, Antarctica)**, *Terra Antarctica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.10-13, 21 refs.

This study describes the contrasting exhumation P-T paths revealed by the three tectonic complexes which make up the high-grade metamorphic belt exposed at Gerlache Inlet, and between Snowy Pt., Boomerang Glacier and Black Ridge (Deep Freeze Range, Wilson Terrane, northern Victoria Land). The P-T trajectories are derived from geothermobarometric determinations, from garnet zoning modelling and from mineral microstructural relationships. The first two complexes display a poly-metamorphic evolution characterized by microstructural evidence of decompressional reactions that imply clockwise trajectories, while the third complex is monometamorphic and evolved along a counterclockwise P-T path. (Auth.)

E-50769

Talarico, F., Borsi, L., Lombardo, B., **Preliminary geochemical data on relict granulites from the southern Wilson Terrane (Ross orogen, northern Victoria Land, Antarctica)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.14-18, 18 refs.

Geology and geochemistry of high-grade metamorphic rocks from the southern Wilson Terrane outline the composite nature of the relict granulite complex which is believed to result from the intrusion of two geochemically distinct igneous suites into a pre-existing supracrustal sequence preserving distinct sedimentary parentages. Meta-igneous granulites (enderbites) retain a geochemical signature typical of subduction-related magmas. Whole-rock Sm/Nd model ages ranging between 1.8 and 2.2 Ga, the geochemical features of the granulites of igneous origin, and the association of enderbite bodies with supracrustals allow close comparisons with Late Proterozoic granulite facies terrains of the East Antarctic Craton. (Auth.)

E-50770

Talarico, F., Castelli, D., **Migmatitic metasedimentary granulites from Mills Peak and Mt. Emison (Wilson Terrane, northern Victoria Land, Antarctica): a case history of processes involved in the formation of garnet +/- orthopyroxene leucocratic segregations**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.19-22, 14 refs.

Garnet +/- orthopyroxene-bearing leucocratic segregations are commonplace in meta-sedimentary granulites from the Mills Peak-Mt. Emison area (Deep Freeze Range, Wilson Terrane). Petrography and thermobarometry, combined with experimental and theoretical models and comparison with other similar granulite-facies rocks, suggest that Mills Peak-Mt. Emison segregations may represent the products of vapor-absent dehydration reactions involving the incongruent melting of biotite at P=5 kbar and T=850 C. (Auth.)

E-50771

Giorgetti, G., Frezzotti, M.L., Palmeri, R., **Composition and role of fluid phases in migmatites from the Gerlache Inlet (Terra Nova Bay, northern Victoria Land, Antarctica): preliminary results**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.23-25, 11 refs.

A fluid inclusion study was performed in migmatitic rocks from Gerlache Inlet. Four major groups of fluid inclusions have been recognized with petrographic, microthermometric and Raman techniques. In *mesosomes* three populations are present: high-density monophase (L) CO₂ inclusions, with 1 mole% CH₄; low-density CO₂-rich inclusions, with 4 mole% N₂ and 2 mole% CH₄; finally, a tardive generation of H₂O-bearing fluids. In *leucosomes*, besides these three populations, a fourth type, mixed CO₂+H₂O-bearing fluid inclusions has been recognized. Density and distribution of this mixed CO₂+H₂O fluid are consistent with P-T conditions of the migmatitic event (4/4.5 Kbar-700/750 C); fluid composition confirms H₂O activity of about 0.4/0.5, in agreement with petrological data. High-density CO₂-dominated fluids give indication of an isobaric cooling characterizing the retrograde evolution of these rocks at high temperatures. (Auth.)

E-50772

Borsi, L., Petrini, R., Palmeri, R., Talarico, F., **Geochemical and isotopic characterization of mafic dykes from central Victoria Land, Antarctica**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.26-28, 10 refs.

Mafic dykes cutting across the gneissic basement of the Wilson Terrane in northern Victoria Land were analyzed for major and trace element compositions and Sr-Nd isotope ratios. Samples were collected at

Gerlache Inlet; 6 in the polymetamorphic migmatitic complex near Gondwana Station and 2 in the monometamorphic sedimentary sequence, about 2 km west of Gondwana Station. Mafic dykes consist of amphibolites, in a few cases showing relics of their pristine igneous texture. The primary magmatic mineralogy has been almost completely replaced by a Hbl-Plg-Qtz-Bt mineral assemblage. The major and trace element chemistry of these rocks could outline fractionations of mafic phase, along with cumulitic processes, except for alkalis, which probably underwent post-magmatic mobilization due to circulating fluids. Nevertheless, these rocks have some chemical and isotopic signatures which reflect their primary igneous origin, and allow one to hypothesize a genesis from a depleted mantle variably modified by crustal recycled components. (Auth.)

E-50773

Musumeci, G., Pertusati, P.C., Ricci, C.A., Talarico, F., **Synkinematic emplacement of some Granite Harbour intrusives: field and microstructural observations from Dry Valleys to Mountaineer Range (Victoria Land, Antarctica)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.29-32, 13 refs.

In Victoria Land, the Granite Harbor Intrusives constitute a wide batholith which crops out from the Dry Valleys to the SW, to the Mountaineer Range to the NE. Most of the intrusions which show unfoliated or poorly foliated fabrics are regarded as late- or post-tectonic intrusions in respect to the latest stages of the Ross orogeny. Several foliated intrusions also occur in medium- and high-grade rocks either as large elongated plutons in the Dry Valleys, or as dykes or sheet-like bodies in the Wilson Terrane of northern Victoria Land. The field relations with the host rocks and their fabrics point to a synkinematic emplacement during a compressional regime. A complex foliation pattern, developed under conditions ranging from magmatic flow to low-temperature solid-state flow, has been recognized in these intrusions. It indicates that foliation development was influenced not only by the deformational regime but also by the thermal conditions of the host rocks and by relations between the rates of magmatic and tectonic processes. (Auth. mod.)

E-50774

Fadda, S., Franceschelli, M., Giorgetti, G., **Mineralogy and metamorphic zonation in low-grade metasediments from the Priestley Glacier, northern Victoria Land, Antarctica**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.33-36, 10 refs.

The mineralogy and mineral chemistry of low-grade rocks from the upper Priestley Glacier area are described to define the metamorphic zonation and P-T conditions of the Ross age metamorphism. Two metamorphic zones of increasing metamorphic grade have been distinguished: the ankerite and biotite zones. The metamorphic temperature ranges from 320 to 400 C. The Ross metamorphism falls into the range of low-pressure metamorphism. (Auth.)

E-50775

Rocchi, S., et al, **Regional isotope patterns of Cambro-Ordovician granitoids from the Wilson Terrane, northern Victoria Land, Antarctica**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.37-39, 8 refs.

Sr and Nd isotope systematics of Ross-age granitoids from the Wilson Terrane show different regional patterns in the area between the Wilson-Bowers suture and the Tinker Glacier, with respect to the Deep Freeze Range. The genesis of these granitoids involves multiple sources. Mixing models for the two areas separated by the Tinker Glacier indicate geochemically different crust and mantle end-members. The Tinker Glacier should lay on an important crustal discontinuity where distinct sectors come into contact. (Auth.)

E-50776

Turi, B., et al, **Oxygen and strontium isotope study of the Cambro-Ordovician Granite Harbour Intrusives, northern Victoria Land, Antarctica**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.40-42, 15 refs.

New oxygen isotope data and some strontium isotope compositions of samples belonging to the three Cambro-Ordovician plutonic suites (high-K calcalkaline suite, shoshonitic suite, and peraluminous suite) as well as some samples of the pre-batholithic basement in the Priestley-Aviator glaciers region (northern Victoria Land) are reported. The data indicate that the recycling of crustal material played an important role in the genesis of these granitoids. The positive correlation between $\delta^{18}\text{O}$ and ($^{87}\text{Sr}/^{86}\text{Sr}$) (510Ma), noticeable for the high-K calcalkaline and shoshonitic samples, suggests the involvement of a subcrustal component in the generation of the metaluminous magmas. For the synkinematic and for some post-kinematic peraluminous granites, the reported data point to a purely crustal origin, as previously hypothesized. (Auth.)

E-50777

Frezzotti, M.L., Di Vincenzo, G., Ghezzi, C., **Fluid regimes in Cambro-Ordovician granitoids from northern Victoria Land, Antarctica**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.43-45, 9 refs.

Examination of fluid, solid and melt inclusions in Cambro-Ordovician granitoids from northern Victoria Land revealed evidence of different fluid regimes, during late crystallization conditions, and the overall subsolidus evolution in the 3 main granite intrusive series. Magmatic $\text{CO}_2+\text{H}_2\text{O}$ fluids were present during the crystallization of peraluminous granites. There is no evidence for magmatic CO_2 in the metaluminous suites (high-K calcalkaline and shoshonitic series). In the peraluminous granites, different oxygen fugacity conditions lead to substantially different fluid composition during the hydrothermal (carbothermal) evolution: fluids in the synkinematic suite have a CO_2 regime above 700 C, a water regime up to 400 C and a CH_4 regime below 400 C; in the postkinematic Tinker type granites, fluids are $\text{CO}_2\text{-H}_2\text{O}$ mixtures, progressively richer in H_2O . These different fluid regimes suggest that CO_2 may have played an important role in the genesis of the peraluminous granitoid rocks in the middle-lower crust. (Auth.)

E-50778

Tonarini, S., Rocchi, S., **Geochronology of Cambro-Ordovician intrusives in northern Victoria Land: a review**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.46-50, 17 refs.

Geochronologic data collected on the Palaeozoic suites of granitoids cropping out in northern Victoria Land reveal a long-standing and complex structural evolution. A peak condition of metamorphism at about 540 Ma is well recognized within Rennick Schist and is associated with the emplacement of S-type granites of the Wilson Plutonic Complex. This metamorphic episode was followed by the syn- and post-kinematic intrusion of a metaluminous suite of Cambro-Ordovician granitoids in the range of 530-470 Ma, known in the literature as Granite Harbour Intrusives. S-type leucogranites with syn-kinematic features still belong to this phase and their age cannot be simply assumed as an age of regional metamorphism, since they appear to be linked to local movements of the orogenic belt as in the case of the Deep Freeze Range region. Cooling ages of granitoids cluster around values of 460 Ma north of the Priestley Glacier and higher than 480 Ma in South Victoria Land Intrusives. (Auth.)

E-50779

Castelli, D., Oggiano, G., Scambelluri, M., Talarico, F., **Peak metamorphic conditions and retrograde P-T paths in the eastern Wilson Terrane and the Dessent Unit (northern Victoria Land, Antarctica): new constraints to tectonic model**

for the Wilson Terrane and the Wilson T.-Bowers T. boundary, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.51-53, 18 refs.

Recent petrological data on metamorphic rocks from both the Wilson Terrane and the Dessent Unit are used to discuss different P-T-t paths which occurred during the Ross event in the suture zone between Wilson and Bowers Terranes. Trajectories are in agreement with crustal thickening of the Wilson Terrane towards the suture zone and can be compared, on a regional scale, with plate-tectonic interpretation of the Paleo-pacific margin of Gondwana. (Auth.)

E-50780

Musumeci, G., Capponi, G., Meccheri, M., Oggiano, G., **Deformed intrusives along the Wilson-Bowers Terranes boundary (northern Victoria Land): structural features and tectonic evolution**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.54-58, 13 refs.

The tectonic boundary between the Wilson Terrane (WT) and the Bowers Terrane (BT) south of Niagara Icefalls is marked by several foliated intrusions of Upper Cambrian age, forming the "Tonalite Belt". Their emplacement was syn-tectonic to the Ross Orogeny; however, different deformation and kinematic patterns characterize these intrusions south and north of the Gair Glacier. Two hypotheses are here proposed for the evolution of the Tonalite Belt and its role during the tectonic evolution of the eastern area of northern Victoria Land. The occurrence of a post-Ross Orogeny tectonic event (the Borchgrevink event) is suggested to have been responsible for the WT-BT coupling. (Auth.)

E-50781

Vita-Scaillet, G., Féraud, G., Ruffet, G., Lombardo, B., **K/Ar and $^{40}\text{Ar}/^{39}\text{Ar}$ laser-probe ages of metamorphic micas and amphibole of the Wilson Terrane and Dessent Unit, northern Victoria Land (Antarctica): their bearing on the regional post-metamorphic cooling history**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.59-62, 13 refs.

K/Ar and $^{40}\text{Ar}/^{39}\text{Ar}$ single-grain ages are reported for 50 biotites, 3 muscovites plus one amphibole from the Wilson Terrane and the adjacent Dessent Unit in northern Victoria Land. The results indicate that the post-metamorphic cooling history during the Ross Orogeny is almost certainly identical and rapid for both units with very consistent $^{40}\text{Ar}/^{39}\text{Ar}$ mineral ages clustering around 477 Ma. K/Ar biotite ages show no correlation with the regional metamorphic grade but seem to reveal four spatially distinct age groups. Average ages calculated for each of these groups increase away from the Priestley-Tinker zone, where the average K-Ar age is 455 Ma both to the west, where a mean value of 466 Ma is found in the O'Kane-Priestley zone, and to the east where values of 469 and 480 Ma are calculated for the Tinker-Icebreaker and Retreat Hills-Mt. Murchison zones, respectively. Such age variations possibly reflect regional variations in uplift rates and/or local deformational history, but they need further $^{40}\text{Ar}/^{39}\text{Ar}$ confirmation. (Auth.)

E-50782

Capponi, G., Carosi, R., Meccheri, M., Oggiano, G., **Strain determination and tectonic evolution in the Millen Range area (northern Victoria Land, Antarctica)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.63-66, 21 refs.

The results of structural and finite strain analyses on samples from the Millen Range and surroundings are presented. The samples are mainly clastic rocks affected by low to very low grade metamorphism, and belong to the Cambrian-Ordovician formations of the Wilson, Bowers and Robertson Bay Terranes and to the Millen Schist metamorphics.

Strain analysis was carried out using several methods, in order to perform a cross check of the determinations. Results suggest that the prevailing deformation is due to apparent flattening. The measured strain data underestimate the real deformation which affected the tectonic units, and show a scattered distribution on a Flinn diagram; the strain evolution appears to have been complex because of strain partitioning controlled by lithology. The microstructural features suggest an important role of simple shear in the deformation of Millen Schist, whose samples exhibit a more complex tectonic evolution and higher strain values than Bowers and Robertson Bay rocks. The Millen Schist can be regarded as a shear belt along which Bowers and Robertson Bay Terranes were amalgamated during the Ordovician Ross Orogeny. (Auth.)

E-50783

Visonà, D., Cavazzini, G.C., Zantedeschi, C., Lombardo, B., **Age, geochemistry and petrology of the Tucker Granodiorite, northern Victoria Land, Antarctica**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.67-69, 13 refs.

The Tucker Granodiorite Pluton (TGP), outcropping in the southern part of Robertson Bay Terrain (RBT), is an I-type calc-alkaline orogenic Devonian body emplaced at high crustal levels (10-12 km). TGP rocks are dominant granodiorite and tonalite and minor granite with frequent microgranular mafic enclaves and clots of Pl+Hbl+Bt. The mineral phases of both host rocks and enclaves or clots display similar compositions and identical zoning. These observations and chemical considerations based on major, trace and REE suggest that fractional crystallization is the main process responsible for the observed lithological variation. Results suggest a slow but constant uplift of the host basement between 370 and 30 Ma. Nevertheless, the lack of evidence in TGP of the tectonic and magmatic event at about 200 Ma suggests differential uplift among different basement portions, or a complicated thermal history between 231 and 30 Ma. (Auth. mod.)

E-50784

Bozzo, E., Caneva, G., Capponi, G., Colla, A., **Further evidence of the lack of a magnetic signature for the junction between Wilson and Bowers Terranes (northern Victoria Land, Antarctica)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.70-72, 3 refs.

During the austral summer 1989-90 (ItaliAntartide V expedition) a magnetic survey was carried out in the area of contact among the Wilson Terrane, the Dessent Unit and the Bowers Terrane. The magnetic data and their modeling show that in this area, the main features of the magnetic field are controlled by the high susceptibility bodies of Meander Intrusives and McMurdo Volcanics. Moreover, they suggest that there is no special magnetic signature linked to the Bowers-Wilson contact. (Auth. mod.)

E-50785

Mazzarini, F., Salvini, F., **Tectonic blocks in northern Victoria Land (Antarctica): geological and structural constraints by satellite lineament domain analysis**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.74-77, 21 refs.

The structural analysis on a regional scale of crustal blocks was performed by satellite image data (LANDSAT MSS satellite). The occurrence of tectonic blocks in northern Victoria Land was determined by satellite lineament analysis. By analyzing the spatial distribution of these linear structural features the authors were able to recognize the crustal blocks and to define their shapes and boundaries. The recognized tectonic blocks, characterized by the occurrence of association of lineament domains, are compared with geological data and morphological features. (Auth.)

E-50786

Salvini, F., Storti, F., **Domino faulting in northern Victoria Land (Antarctica): preliminary data from the Mt. Murchison quad area**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.78-81, 34 refs.

In the central sector of northern Victoria Land, an analysis of the dip of the sub-Beacon Peneplain and its cover allowed the authors to outline a fault pattern in a domino-like array, related to the genesis of the down-faulted Ross Sea rift system. The NE-SW striking of the occurring faults represents a particular feature of the coastal region, probably due to the isostatic rebound of the rift shoulder. The occurrence of well-developed NNW-SSE striking strike-slip faults may be linked to the activity of the transform fault systems of the Australia-Antarctica Mesozoic-to-present rifting. The beginning of the faulting process and the kinematics of its evolution are uncertain, as is the age of the oldest deposits into the sedimentary basins. It is suggested that the abrupt change in the erosion rates around 50-45 Ma may be related to the NE striking faults activity. In the Southern Cross Mountains the fault escarpments were sutured by lava flows belonging to the McMurdo Volcanics. Chronological data from some samples collected at the head of the Tinker Glacier gave an age of 12.4-12.6 Ma, and may represent the upper limit for the fault activity in the area. (Auth. mod.)

E-50787

Balestrieri, M.L., Bigazzi, G., Ghezzi, C., Lombardo, B., **Fission track dating of apatites from the Granite Harbour Intrusive Suite and uplift-denudation history of the Transantarctic Mountains in the area between the Mariner and David Glaciers (northern Victoria Land, Antarctica)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.82-87, 23 refs.

Two sets of apatite samples from the Granite Harbour Intrusive Suite, collected in the region between the Mariner and David Glaciers, were analyzed by the fission track method. The first set refers to samples distributed in a wide area, whereas apatites of the second set are from a vertical profile at Mt. Nansen, at elevations between 220 m and 2380 m. The ages (from 16.2 to 241 Ma) are consistent with those published for adjacent regions, and confirm the Cenozoic uplift and denudation phase of the Transantarctic Mountains. The FT ages of the apatites from Mt. Nansen, between 31 Ma and 198 Ma, show an evident correlation with elevation, with a clear break in slope at about 1800 m and 80 Ma. This break in slope is interpreted as the base of an uplifted palaeo-partial annealing zone (PAZ). The corresponding age, 80 Ma, represents the beginning of an uplift-denudation phase. (Auth. mod.)

E-50788

Buccianti, A., Prati, F., **Preliminary data on the content of volatile elements in the rocks from Mount Erebus (Ross Island, Antarctica)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.88-91, 15 refs.

Rock samples from Mount Erebus, collected during a joint mission with the New Mexico Institute of Mining and Technology, have been analyzed for carbon, sulphur, chlorine and fluorine. The results show that F and Cl in the Mount Erebus rocks have probably derived from the partial melting of a source region that contained phlogopite; then, fractional crystallization processes have concentrated these elements in residual liquids. C and S seem to show similar geochemical behavior in this volcanic system. (Auth. mod.)

E-50789

Casnedi, R., Di Giulio, A., Rossi, A., **Sandstones of the Beacon Supergroup near Terra Nova Bay (northern Victoria Land, Antarctica): preliminary results of facies and petrographic analyses**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic

Observatory results 1990-91. News from the International Cooperative Programmes, p.92-95, 12 refs.

Clastic sequences of probable Triassic age, ascribed to the Beacon Supergroup, crop out inland of Terra Nova Bay. Their sedimentary structures (mainly high angle cross-bedding) show an alluvial environment with braided channels. Aeolian deposits are also present in the northernmost sequence. Within the sedimentary bodies, volcanoclastic layers of basaltic nature are interbedded. The petrographic analyses presently in progress on the Mt. New Zealand sequence demonstrate a source from the erosion of a granitic continental block with elements derived from probably syndepositional volcanic flows. The thick basaltic body underlying the Beacon sandstone in the same sequence can be interpreted as a flow instead of a sill, opening new prospects on the age of volcanic activity and relationships with the siliciclastic sedimentation. (Auth.)

E-50790

Vezzalini, G., Quartieri, S., Rossi, A., Alberti, A., **Occurrence of zeolites from northern Victoria Land (Antarctica)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.96-99, 20 refs.

The first study on zeolite minerals occurring in rocks from the antarctic continent is reported. The following zeolites were identified: heulandite, mordenite, erionite, levyne, chabazite, thomsonite, scolecite, epistilbite. The microprobe analyses show that most antarctic zeolites are richer in Si and monovalent cations with respect to the hydrothermal zeolites reported in the literature. The chemical analysis and the X-ray diffraction pattern of an unidentified phase from Mt. Adamson with zeolitic characteristics are also reported. (Auth.)

E-50792

Mazzarini, F., Salvini, F., **Contribution to geothermal survey by spectral analysis of TM Landsat satellite data in Mt. Melbourne area, northern Victoria Land (Antarctica)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.104-106, 3 refs.

This work makes a regional contribution to the geothermal exploration of the Mt. Melbourne volcano area north of the Italian Terra Nova Bay Station (northern Victoria Land) by processing and interpreting TM Landsat satellite images. A comparison of the radiance in bands 4, 6 and 7 reveals a series of spots of emission spectra in the infrared interval corresponding to anomalous higher surface temperatures. Such results may represent indications of fumarole activity and are suggested for further field investigations. (Auth.)

E-50793

De Santis, L., Brancolini, G., Buseti, M., **Structural evolution of the Victoria Land Basin south of the Drygalski Ice Tongue (western Ross Sea)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.107-110, 16 refs.

In the Victoria Land Basin (VLB) two main tectonic phases have been recognized. The first, Jurassic-Early Tertiary, started with the initial phases of the Gondwana break-up that produced crustal thinning in the west antarctic crust (West Antarctic Rift). In the VLB, about 7 km of sediment in an almost symmetric trough were deposited. The second, Early Tertiary-Present, produced a reactivation of the subsidence (Discovery Graben) and the formation of a north-south magmatic arc (Lee Arc). Using multichannel seismic lines collected in 1990 by OGS and in 1984 by USGS, a 250 km east-west section south of the Drygalski Ice Tongue in the VLB has been constructed. The section starts 50 km onshore, where the basement (Granite Harbour Intrusives and Kirkpatrick Basalt or Ferrar Dolerite) outcrops, crosses the deepest part of the basin, and illustrates the relationships between the Lee Arc and the surrounding sequences. The section terminates on the western flank of the Coulman High. (Auth. mod.)

E-50794

Buonocore, B., Giorgetti, F., Mirabile, L., Severino, V., **Side scan sonar, an investigation of some marks on the Joides Basin seafloor**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.111-114, 6 refs.

In the course of the 1990-91 antarctic survey of the Italian Programma Nazionale di Ricerca in Antartide (PNRA) a number of side-scan sonar readings were taken over a limited area in Joides Basin in the Ross Sea. Analysis of the mosaic obtained reveals several interesting configurations, which are described and illustrated. (Auth. mod.)

E-50795

Antonini, P., et al, **Mount Melbourne and Mount Overlord subprovinces of the McMurdo Volcanic Group (northern Victoria Land-Antarctica): new geochemical and Sr-isotope data**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.115-119, 23 refs.

The area extending northward from Terra Nova Bay to Parasite Cone has been investigated. Most of the volcanic edifices have been sampled for petrological studies. The area is characterized by NW-SE and NNE-SSW trending fractures and tensile faults. Volcanism began about 35 Ma and was related to this tensional tectonism. The investigated volcanics include basanite-phonolite (B-Ph) and basalt-trachyte-comendite (AB-Tc) suites. Chemical variations within the two suites have been explained as the result of fractional crystallization processes from distinct primary melts generated by different degrees of partial fusion of mantle sources. These sources were characterized by a continuous variation of Sr isotopic compositions that suggests a common history of mantle metasomatic processes. Metasomatism was likely related to asthenospheric mantle upwelling associated with rifting and uplifting of the Transantarctic Mountains. (Auth.)

E-50796

Lanza, R., **Paleomagnetic investigations in Victoria Land**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.123-124, 12 refs.

A palaeomagnetic program was initiated during the 6th Italian Expedition to Victoria Land (austral summer 1990-91), with the intent to determine a more precise apparent polar wander curve for East Antarctica. The Ordovician Granite Harbour Intrusives, the Jurassic Ferrar dolerite, the Cenozoic Meander Intrusives and some Palaeozoic(?) to Tertiary dykes were more or less extensively sampled. This report gives a short account of the main results from the Ferrar dolerite and some preliminary data from the other rocks. (Auth. mod.)

E-50797

Finetti, A., et al, **Preliminary geophysical study of the Ross Sea (Antarctica)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.127-129, 2 refs.

The multichannel seismic reflection data recorded in the Ross Sea by the Italian geophysical expeditions, integrated with the geological and geophysical information obtained from previous international research, have been interpreted and partly reprocessed with advanced techniques to study the seismic stratigraphy and structure of the sedimentary cover. On the basis of the seismic interpretation and of the available geological calibrations, a detailed tridimensional image of 3 reflectors has been reconstructed and is discussed. (Auth. mod.)

E-50798

Buseti, M., Brancolini, G., De Santis, L., **Seismic sequences analysis from the Ross shelf**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Pro-

ceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.130-133, 17 refs.

From multichannel seismic lines collected in the Ross Sea, different seismic units separated by unconformities have been identified. The sedimentary sequences and the unconformities are the result of the interaction of different processes: subsidence, tectonism, sediment supply and eustasy. The unconformities have been mapped; their distribution and geological significance are discussed. (Auth.)

E-50800

Folco, L., Bland, P.A., **Meteorites from the 1990/91 EUROMET expedition to Frontier Mountain, northern Victoria Land, Antarctica, *Terra Antartica***, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.138-142, 24 refs.

Two hundred forty-three meteorite samples have been recovered by the 1990-91 EUROMET expedition to Frontier Mountain, northern Victoria Land. Preliminary classification of 167 of these specimens is reported, emphasizing the most interesting ones and their significance in terms of asteroids and solar system evolution through brief reviews and comments. In addition, the authors show preliminary results of attempts to pair the Frontier Mountain collection, and their implications in terms of mass distribution and type-frequency. (Auth.)

E-50801

Maras, A., Levi-Donati, G.R., Serracino, M., **Classification of twelve meteorites from Frontier Mountain, Antarctica, *Terra Antartica***, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.143-146, 8 refs.

Thirteen polished thin sections of meteorite samples, recovered at Frontier Mountain by the Italian antarctic expedition in cooperation with EUROMET, were inspected by optical microscopy and analyzed by electron microprobe, and classified into chemical groups and petrologic types. Among these, eight are H chondrites, two are L chondrites, one is unequilibrated L(LL) chondrite, and FRO90011 is a chondrite with absence of chondrules and achondritic texture, between Acapulco and Lodran types. (Auth.)

E-50802

Molin, G.M., Fioretti, A.M., Salviulo, G., Carampin, R., **Petrography, mineralogical analysis, and classification of 22 meteorites from Frontier Mountain-Antarctica, *Terra Antartica***, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.147-149, 6 refs.

A preliminary classification of 22 meteorites out of the 243 collected in the blue ice field of the Frontier Mountain Range, Victoria Land during the 1990 Italian antarctic expedition was carried out during 1991-92 within the EUROMET project. Twenty-four polished thin sections prepared at the Natural History Museum (London) laboratory were studied by optical microscopy (transmitted and reflected light) and electron microprobe. Petrographic investigation revealed the texture, structure, and mineralogical composition of each meteorite, and allowed the following: grouping into ordinary chondrites, achondrites and terrestrial material; and identification (for chondrites) of main characteristics for the definition of petrologic type according to Van Schmus & Wood (1967) modified by Dodd (1981). (Auth. mod.)

E-50803

Baroni, C., Orombelli, G., **Retreat of the antarctic ice sheet from the Ross Sea continental shelf and the Holocene diffusion of Adélie penguins in Victoria Land, *Terra Antartica***, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.151-

152, 12 refs.

In the Terra Nova Bay region, between the Late Wisconsin trimline and the present glacier surface, there are moraines located at different levels which bear witness to distinct recessional phases of the outlet glaciers that directly drain the East Antarctic ice sheet. In particular, they are recorded near Andersson Ridge, at Mt. Matz, Black Ridge and Mt. Keinath and testify to the presence of minor glacier advances in a generally recessional period. Further information about the history of the glacial retreat which followed the Last Glacial Maximum has been supplied by the ^{14}C dates obtained from marine organisms associated with marine sediments, or from entrapped organisms in floating ice shelves. A great deal of information has come from studies on the distribution of abandoned penguin rookeries (*Pygoscelis adeliae*) which supplied data both about the history of the deglaciation and about the environmental picture of the Holocene. (Auth. mod.)

E-50804

Camerlenghi, A., Lodolo, E., **Bottom simulating reflector on the South Shetland margin (Antarctic Peninsula) and implications for the presence of gas hydrates, *Terra Antartica***, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.154-157, 20 refs.

Multichannel seismic data acquired over the northern Pacific margin of the Antarctic Peninsula have shown the presence of high-amplitude sub-bottom reflections across part of the South Shetland accretionary prism. Detailed seismic data analysis, such as true amplitude signal recovery, reflection coefficient determinations and closely-spaced semblance velocity analysis, have been carried out in order to definitely assign this bottom simulating reflector to the base of the stability field for methane hydrate. This represents the first evidence of gas hydrate layers in the Antarctic Peninsula region. (Auth.)

E-50805

Lodolo, E., Coren, F., **Westernmost Pacific-Antarctic plate boundary in the vicinity of the Macquarie Triple Junction, *Terra Antartica***, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.158-161, 24 refs.

Since the original detailed study of the area around the Antarctic, Pacific and Australian plates at the southern end of the Macquarie Ridge Complex in the southwest Pacific Ocean by the Eltanin cruises (early 70's), few new survey data of the region have been obtained. Cruises by the research vessel OGS-Explora, carrying out multichannel seismic, gravity, magnetic and bathymetric measurements during the austral summers of 1988-89, 89-90 and 90-91 have contributed about 6300 km of new data. From the analysis of the data, there is considerable evidence that a change occurred in the Pacific/Antarctic plate motion which instigated a compressive regime along the Macquarie Ridge. The change in relative motion determined a conspicuous structural reorganization of the westernmost Pacific/Antarctic plate boundary, with creation of a late Miocene(?) leaky transform fault that currently marks the boundary between the two plates. (Auth.)

E-50812

Barrett, P.J., **Coring for antarctic climatic and tectonic history: the Cape Roberts project, *Terra Antartica***, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.218-221.

In 1990 Italy's OGS Explora, at the request of New Zealand scientists, extended its seismic survey of the Ross Sea to a small area off Cape Roberts. The purpose was to collect more information about the strata beneath the sea floor for planning a new drilling project to investigate the early history of antarctic glaciation and Ross sea rifting. Since that time the project has been developed at a workshop held in May 1992 in Wellington, New Zealand, and at a meeting in Siena in Apr. 1993. A further meeting in Washington D.C. in Sep. 1993 has resulted in a commitment

to what is now a \$4 million project by five countries (Britain, Germany, Italy, New Zealand, United States), with drilling scheduled for late 1995 and 1996.

E-50813

Brancolini, G., **ANTOSTRAT project: concepts and target**, *Terra Antarctica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.222-225, 12 refs.

During a meeting in Munich, Germany in Apr. 1989, the Group of Specialists on the Evolution of Cenozoic Paleoenvironments of the Southern High Latitudes proposed a multi-year and multi-disciplinary program for the study of the Cenozoic sedimentary bodies around Antarctica, with particular reference to the large sedimentary wedges forming the outer part of the continental shelf. The project, called ANTOSTRAT (Antarctic Offshore Acoustic Stratigraphy) was endorsed by SCAR in 1991. The general objectives of the project are outlined.

E-50814

Tessensohn, F., **LIRA: Lithospheric Investigations in the Ross Sea Area**, *Terra Antarctica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.226-228, 4 refs.

Lithospheric Investigations in the Ross Sea Area (LIRA) is a regional program which aims at the coordination of geoscientific activities in the region of the Ross Sea and adjacent areas. It intends to provide opportunities to discuss present and future activities, and to promote international cooperative investigations through the joint use of existing logistic means. The first joint field project under the umbrella of LIRA took place in the 1991-92 season under the acronym GITARA (German Italian Aeromagnetic Research in Antarctica). It was carried out with German instrumentation and Italian logistics (helicopters) in area S of the Reeves Glacier in Victoria Land. The project found its continuation as GITARA II in the 1992-93 season over the western flank of Marie Byrd Land and the Eastern Ross Sea, this time with German logistics, Italian scientific program contributions and U.S. participation. Further joint work is planned in the future with the aim to eventually cover the whole of Victoria Land and the adjacent Ross Sea with a close-spaced grid of aeromagnetic lines.

E-50815

Mellini, M., **EUROMET: an European meteorite collection programme**, *Terra Antarctica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.229-230.

EUROMET, formed in 1989, is a scientific organization of over 50 laboratories and 220 scientists from 15 European countries, dedicated to the collection, curation and worldwide distribution of meteorites and cosmic dust for interdisciplinary investigation. Apart from other minor activities, EUROMET has been involved in antarctic expeditions: in 1990-91 a team of 4, logistically supported by PNRA, systematically searched for meteorites in the Frontier Mountain area and was successful in collecting 259 meteorites; in 1990-91 at Cap Prudhomme, a French team used steam generators to melt 260 tonnes of ice and separated different fractions of sediments containing several micrometeorites, interplanetary dust particles and spherules; in 1991-92 at Sequence Hills during the GANOVEX VII expedition the locality was visited to check for possible meteorite traps; meteorite search is hampered there by the presence of large meltwater lakes.

E-50818

Miller, M.F., Collinson, J.W., **Late Paleozoic post-glacial inland sea filled by fine-grained turbidites: Mackellar Formation, central Transantarctic Mountains**, Earth's glacial record. Edited by M. Deynoux et al, Cambridge, University Press, 1994, p.215-233, Refs. p.231-233.

Sandstones and shales of the Lower Permian Mackellar Formation conformably overlie glacial sediments and are conformably overlain by braided stream deposits. They record the filling of a large fresh to brackish water post-glacial inland sea by fine-grained turbidites (silt, fine sand) deposited in prograding channel-overbank systems. Upward-coarsening sequences 10 to 25 m thick are capped by broadly cross-cutting channels a few meters deep and hundreds of meters wide. Sediment-laden streams entering the inland sea from the adjacent braidplain delta delivered sediment directly to the turbidite systems; Gilbert-type deltas and distributary mouth bar deposits are rare or absent. Fine-grained submarine fans and turbidite systems typically lack upward-coarsening trends and are characterized by a few stable channels. The Mackellar turbidites illustrate that upward-coarsening sequences recording progradation by channel-overbank complexes form in fine-grained turbidite systems, and demonstrate that these systems can be characterized by numerous shifting channels. Fine-grained turbidite systems adjacent to and conformably overlain by sandy braidplain delta deposits may be characteristic of the filling of large post-glacial lakes or inland seas. Continental glaciation produces large quantities of poorly sorted sediment. After glaciation, streams reworking the glacial deposits transport fine-grained sediment to the inland sea, leaving behind the coarser sand on the braidplain. (Auth.)

E-50819

Hall, K., **Rock moisture data from Livingston Island (maritime Antarctic) and implications for weathering processes, Permafrost and periglacial processes**, July-Sep. 1993, 4(3), p.245-253, With French summary. 28 refs.

Rock moisture content was determined for rock samples on different aspects of rock outcrops on Livingston I. during a summer season. As a result of the dominant rainbearing northerly winds the southern aspect usually has rock moisture levels lower than the northern. The southern aspect, however, experiences high rock moisture levels during periods of snowmelt; snow accumulates on the southern, lee-side of the rock outcrops. Wetting and drying events are more frequent on the northern exposure, although not as common as at a site open through the full 360 deg, while the southern aspect tends to experience continuous low moisture levels with infrequent dry events. Contrary to earlier suggestions, freeze-thaw weathering does not appear to be a major factor during the summer. Although rock moisture levels are conducive to freeze-thaw, rock temperatures rarely go below 0 C. Rather, it appears that weathering due to wetting and drying may be more common on the northern aspects than was previously thought while chemical weathering is active on southerly aspects. Rock moisture levels may support rock damage due to segregation ice during the winter freeze when the rate of freezing is slowed by the overlying snow cover. (Auth. mod.)

E-50820

Anderson-Fontana, S., et al, **Tectonics of the Nazca-Antarctic plate boundary**, *Earth and planetary science letters*, Nov. 1987, 86(1), p.46-56, 14 refs.

DLC QE1.E12

A new bathymetric chart was constructed of part of the Chile transform system, based mainly on an R/V *Endeavor* survey from 100W to its intersection with the East Ridge of the Juan Fernandez microplate. A generally continuous lineated trend can be followed through the entire region, with the transform valley being relatively narrow and well-defined from 109W to approximately 104.5W. The fracture zone then widens to the east, with at least two probable en echelon offsets to the south at 104 and 102W. Six new strike-slip mechanisms along the Chile Transform and one normal fault mechanism near the northern end of the Chile Rise, inverted together with other plate motion data from the eastern portion of the boundary, produce a new best fit Euler pole for the Nazca-Antarctic plate pair, providing tighter constraints on the relative plate motions. (Auth.)

E-50824

Jordan, R.W., Pudsey, C.J., **High-resolution diatom stratigraphy of Quaternary sediments from the Scotia Sea**, *Marine micropaleontology*, July 1992, 19(3), p.201-237, Refs. p.234-237.

DLC QE719.M27

Upper Quaternary pelagic and hemipelagic sediments from the Scotia Sea and South Scotia Ridge range from diatom ooze to diatom-bearing mud. Diatom content increases northwards, and at most sites diatom-rich and diatom-poor sediments alternate downcore on a scale of meters. A local stratigraphy is based on relative abundance of 6 prominent diatom taxa: *Eucampia antarctica*, *Rhizosolenia* spp., *Thalassiosira* spp., *Chaetoceros* spores, *Nitzschia kerguelensis* and other *Nitzschia* species, and one silicoflagellate species (*Distephanus speculum*). These stratigraphic units defined using diatoms are correlated with radiolarian abundance stratigraphy (*Cycladophora davisiana*) and with palaeomagnetic stratigraphy. Information from modern environments (phytoplankton and sediment trap studies) indicates that changes in diatom species composition are related to N-S movement of the winter ice edge and of the Antarctic Convergence. (Auth.)

E-50826

Stump, E., Fitzgerald, P.G., **Episodic uplift of the Transantarctic Mountains**, *Geology*, Feb. 1992, 20(2), p.161-164, 38 refs.

DLC QE1.528

An apatite fission-track age profile from the Scott Glacier region provides evidence of uplift and denudation of the Transantarctic Mountains in the Early and Late Cretaceous. Samples for fission-track analysis were collected over a vertical range of about 2 km from the Mt. Griffith massif. Apatite ages from the upper 700 m of Mt. Griffith vary little with elevation, indicative of rapid cooling accompanying Early Cretaceous uplift and denudation. Ages from the northeast buttress of Mt. Griffith (the Fission Wall) define a steep gradient and are indicative of rapid cooling accompanying Late Cretaceous uplift and denudation. The two parts of the profile are separated by a fault. Subsequent uplift and denudation of the Mt. Griffith massif in the Cenozoic were required to elevate the massif (and the apatite age profile) to its present position. This younger uplift was most likely initiated in the early Cenozoic, penecontemporaneously with well-documented early Cenozoic uplift in the Victoria Land region of the Transantarctic Mountains. (Auth. mod.)

E-50849

Askin, R.A., **Monosulcate angiosperm pollen from the López de Bertodano Formation (upper Campanian-Maastrichtian-Danian) of Seymour Island, Antarctica**, *Review of palaeobotany and palynology*, May 1994, 81(2-4), p.151-164, 52 refs.

Monosulcate angiosperm pollen are very rare in the uppermost Campanian-Maastrichtian-lower Danian López de Bertodano Formation of Seymour I. Nine species are described, including two new species, *Clavamonocolpites polygonalis* sp. nov. and *Gemmamonocolpites pilulus* sp. nov. Other forms include five species of *Liliacidites*, one species of *Arecipites*, and *Clavatipollenites highesii* Couper. They document the presence in the Cretaceous-Tertiary Antarctic Peninsula area of Chloranthaceae, Liliaceae (or other monocotyledonous angiosperms) and possible Palmae. (Auth.)

E-50874

Han, U., Jung, H.C., **Study of the thermal state in the permafrost at the Sejong Station, Antarctica**, International Conference on Permafrost, 6th, Beijing, China, July 5-9, 1993. Proceedings. Vol.2, Guangzhou, South China University of Technology Press, 1993, p.1119-1123, 4 refs.

Borehole temperature measurements at King Sejong Station were made by a geothermal datalogger which was designed by the investigators. From Dec. 31, 1991 to Feb. 1, 1992 temperature data (at depths of 28 cm, 8 cm, -12 cm, -32 cm, -52 cm, and -70 cm) were obtained by resistive sensors every minute. Fast Fourier transforms were made on temperature data including surface air temperature of the meteorological center at Sejong Base every thirty minutes. Profiles of surface and subsurface temperature variations represent freezing, thawing, and heat transfer mechanisms at the boundary between active layer and permafrost table. The thermal diffusivities are determined by the Angstrom method, using underground temperatures. The thermal conductivities of the drilled cores and outcrops are measured by the transient method. The thermal diffusivity and conductivity measurements of rock and soil samples give a significant signal on the inferred climatic temperature of the past millennium at Sejong Base by the inversion technique with well-documented meteorological data. The geothermal data in ice-bearing permafrost at Sejong Station are interpreted in terms of the temperature history on a

time scale of 2,000 years. Two theories are developed: a "forward" theory to calculate the response of ice-bearing permafrost to a surface temperature disturbance, and an "inverse" theory to calculate parameters characterizing the surface temperature history from suitable measurements in the permafrost. (Auth. mod.)

E-50875

Ramos, M., **Preliminary data for permafrost thermal regime and its correlation meteorological parameters near the Spanish Antarctic Station**, International Conference on Permafrost, 6th, Beijing, China, July 5-9, 1993. Proceedings. Vol.2, Guangzhou, South China University of Technology Press, 1993, p.1211-1214, 6 refs.

During 1991-92 antarctic summer a turbulent atmospheric parameter measuring device was installed near the Spanish Antarctic Station (SAS) in order to register the exchanged energy flux between the soil and the lower atmosphere. Temporal evolution of permafrost was also registered using several temperature probes. Exchanged energy flux data and the movement of the free boundary in permafrost were recorded. Permafrost evolution as a function of energy exchange in the soil/atmosphere surface is determined.

E-50880

Yanai, K., ed, NIPR Symposium on Antarctic Meteorites, 18th, Tokyo, May 31-June 2, 1993, **Proceedings of the NIPR Symposium on Antarctic Meteorites, No.7**, Tokyo, National Institute of Polar Research, 1994, 309p., Refs. passim. For selected papers see E-50881 through E-50905.

Twenty-five scientific papers, among 85 presented at the Symposium, are submitted in this volume of the proceedings, covering such subjects as meteorite search, petrology, mineralogy, chemical studies, isotope studies and physical studies on antarctic and non-antarctic meteorites.

E-50881

Yanai, K., Shiraishi, K., Kojima, H., **Asuka-90 meteorites collection from Antarctica: searching, initial processing and preliminary identification**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.1-8, 13 refs.

Over 2400 meteorites have been collected by the Japanese Antarctic Research Expeditions (JARE) on the bare icefield around the Sør Rondane Mountains since 1986. The Asuka wintering party of JARE-30 (1989-91) carried out a meteorite search during a geological survey and collected 48 meteorites on the bare icefield around Mt. Balchen in the eastern part of the mountains in Nov. 1990. During the initial processing, the specimens were officially named the Asuka(A)-9001 to A-9048, in order of discovery. The Asuka-90 meteorites collection was catalogued by NIPR with details of find, weight, dimensions, brief identification and classification data, and comments. According to the preliminary identification, the Asuka-90 meteorites include one achondrite and 47 ordinary chondrites, the total weight being 11.48 kg. The largest specimen is an L chondrite of about 3.27 kg. The Asuka-90 meteorites included no irons, no stony-irons and no carbonaceous chondrites. (Auth.)

E-50882

Ikeda, Y., **Petrography and petrology of the ALH-77005 shergottite**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.9-29, Refs. p.28-29.

The ALH-77005 shergottite is a cumulate gabbroic rock consisting of brown olivine, low- and high-Ca pyroxene, plagioclase glass, Ti-poor and -rich chromite, ilmenite, whitlockite, and sulfides. Chromites in ALH-77005 show four types of chemical zoning, and these types suggest multiple magma mixing. Some plagioclase glass has plagioclase rims, where the rims were produced from plagioclase melts by rapid crystallization. Ubiquitous occurrences of plagioclase glass and shock-melt pockets that were produced by *in-situ* melting indicate that ALH-77005 has experienced shock pressures ranging from 50 to 80 GPa. (Auth.)

E-50883

Yanai, K., **Angrite Asuka-881371: preliminary examination of a unique meteorite in the Japanese collection of antarctic meteorites**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.30-41, Refs. p.40-41.

A new angrite-type achondrite was discovered at a new site of meteorite concentrations in Antarctica by the Japanese expedition party in Dec. 1988. Antarctic meteorite Asuka-881371 (previously Asuka-9) is an angrite-type achondrite, which is a rounded individual stone, almost completely covered with a dull-black fusion crust. Pale green, relatively large porphyritic olivine crystals can be seen on the exposed face of the interior. Asuka-881371 is an unbrecciated igneous rock with typically ophitic (doleritic) texture, consisting mainly of olivine, pyroxene (fassaite) and plagioclase with spinel. From its texture, mineral assemblages and chemical composition, Asuka-881371 is identified and classified as an angrite. However, based on several characteristics, especially bulk chemical composition, Asuka-881371 is different from Angra dos Reis, LEW86010 and LEW87051 angrites which are the three previously known angrites collected from non-antarctic and antarctic regions. (Auth.)

E-50884

Noguchi, T., **Petrology and mineralogy of the Coolidge meteorite (CV4)**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.42-72, Refs. p.70-72.

The petrology and mineralogy of the Coolidge meteorite were investigated by SEM and EPMA. Coolidge has some similarities to the "reduced group" of CV3 chondrites: abundant Fe-Ni metal and sulfide are kamacite, taenite, and troilite; AOIs, CAIs, and chondrules are depleted in Na and K; and the main constituent mineral of the matrix is olivine. In addition to these similarities, Coolidge also has some unique properties: matrix as well as AOIs, CAIs, and chondrules are depleted in Na; there are some plagioclase pyroxene chondrules in this meteorite, as opposed to type IV chondrules, which include various amounts of silica mineral; bulk compositions of CAIs are rich in FeO and Cr₂O₃; compositional variations of spinel in Coolidge are very wide; and correlations between some elements in spinel and those in pyroxenes in Coolidge are different from the "reduced group" of CV3 chondrites but similar to EOCs. Olivine-spinel geothermometry suggests that Coolidge was heated to temperatures as high as 900 C. The duration of thermal metamorphism was short enough to preserve many petrographic features, such as Fe-Mg compositional zoning in low-Ca pyroxene. Distribution of Co between kamacite and taenite suggests fast cooling around 500 C. (Auth. mod.)

E-50885

Takeda, H., Yamaguchi, A., Nyquist, L.E., Bogard, D.D., **Mineralogical study of the proposed paired eucrites Y-792769 and Y-793164 with reference to cratering events on their parent body**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.73-93, 19 refs.

A comparison of the mineralogy of Yamato (Y)-792769 and Y-793164 has been performed to confirm the proposed pairing of these two specimens and to correlate their common shock-sintered textures with the resetting of their isotopic ages. The matrices of the two meteorites share this common texture as described for Y-792769, but their clast types are different. Y-792769 contains pyroxene fragments with Mg-rich compositions, which are not present in the matrix. A large basaltic clast present in Y-793164 includes acicular plagioclase crystals replacing the pyroxene grains. Some pyroxenes are more Fe-rich than those of common monomict eucrites such as Juvinas. The common pyroxene components and the shock-sintered textures support the proposed pairing of Y-792769 and Y-793164. Rb and Sr abundances and isotopic data do not strongly support the proposed pairing of the meteorites, but could be consistent with observed compositional heterogeneities within and between them. Sm and Nd abundances and isotopic data are similar for matrix samples of the meteorites and are consistent with their pairing. (Auth. mod.)

E-50886

Akai, J., **Void structures in olivine grains in thermally metamorphosed antarctic carbonaceous chondrite B-7904**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.94-100, Refs. p.99-100.

The antarctic carbonaceous chondrite Belgica-7904 underwent thermal metamorphism. The main constituent phyllosilicates of this meteorite are serpentine and/or saponite, which display transformation from serpentine to olivine or from saponite to enstatite in various degrees. Detailed Transmission Electron Microscopy (TEM) observation of this meteorite reveals characteristic void structures, which are found mainly in olivine grains. The voids or bubble-like structures are frequently found in some grains. The shapes of the voids are varied. Some are irregular and some are crystallographically controlled. Five possible mechanisms for their origin are: thermal metamorphism; irradiation by high energy particles in the solar nebula; shock effects; sample preparation artifacts; and alteration process. Among five or more possible mechanisms, the voids most likely formed during thermal metamorphism or as a result of irradiation damage by high-energy particles in the early solar system. (Auth.)

E-50887

Akai, J., Sekine, T., **Shock effects experiments on serpentine and thermal metamorphic conditions in antarctic carbonaceous chondrite**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.101-109, 21 refs.

The unique antarctic carbonaceous chondrites Belgica (B)-7904, Yamato (Y)-86720, Y-82162 and Y-793321 are thermally metamorphosed. However, the heat source of the thermal metamorphism is not known. Two strong possibilities are shock-induced heating and heating on the parent body. The explosive impact method was used to check the possibility of heating of phyllosilicates by shock compression. On examining the shocked specimens from the Murchison meteorite and terrestrial lizardite, the following were found: phyllosilicates in the shocked (>32.1 GPa) specimens changed to nearly amorphous substances; the phyllosilicates in specimens shocked at lower pressures were still crystalline and undamaged; some void-like (bubble) textures were widely observed in the amorphous substances; and the other minerals such as pyroxenes and olivines which did not change to glass phases seem to be little affected by shock. These facts suggest that the unique antarctic chondrites did not experience significant shock. (Auth.)

E-50888

Shibata, Y., Matsueda, H., **Chemical composition of Fe-Ni metal and phosphate minerals in Yamato-82094 carbonaceous chondrite**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.110-124, 14 refs.

The mineralogy of Fe-Ni metal and associated minerals in the Yamato (Y)-82094 carbonaceous chondrite (CO) have been studied by optical, scanning electron microscope and electron microprobe techniques. There are some characteristic features for the Fe-Ni metal in the Y-82094: Ni contents in taenite grains are divided into two groups consisting of low- and high-Ni taenite; partition of Co between coexisting kamacite and taenite shows relatively higher temperatures (approximately 800 C), and their temperature ranges are wide; polycrystalline taenite exists; Fe-Ni metal and troilite form micron-sized intergrowths; and the Ni-Co trend of kamacite in chondrule is positive. The Fe-Ni metal grains have many phosphate mineral inclusions (whitlockite, brianite and panethite). The mode of occurrence of brianite and panethite indicates that they might have formed simultaneously with Fe-Ni metal in the nebula. (Auth. mod.)

E-50889

Nakamura, N., et al, **Trace element and isotopic characteristics of inclusions in the Yamato ordinary chondrites Y-75097, Y-793241 and Y-794046**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.125-143, Refs. p.141-143.

Igneous inclusions and hosts of the Yamato ordinary chondrites Y-75097 (L6), Y-793241 (L6) and Y-794046 (H5) were analyzed for lithophile trace elements and Rb-Sr, rare gas and oxygen isotopes, together with preliminary petrographic examinations. On a three oxygen-isotope plot, all the inclusions lie near the H-chondrite field. The Y-75097 host and inclusion were severely shocked and the Rb-Sr systematics were disturbed by a 500 Ma event which was defined by the K-Ar age. The Y-793241 host and inclusion are unshocked and have an old K-Ar age of 4270 \pm 170 Ma and undisturbed Rb-Sr systematics for the bulk meteorite. Both Y-75097 and Y-793241 inclusions have similar chemical compositions and mineral assemblages consisting mainly of olivine and minor plagioclase, chlor-apatite, merrillite and chromite. Olivines in both inclusions equilibrated with those of their L6 hosts. The Y-794046 inclusion comprises abundant anhedral olivines, fractured pyroxenes and microcrystalline plagioclase. The inclusion did not equilibrate with its host which has less Fe-rich olivines and more Fe in pyroxenes. (Auth. mod.)

E-50890

Wang, M.S., Michlovich, E.S., Vogt, S., Lipschutz, M.E., **Labile trace elements and cosmogenic radionuclides in chondritic hosts of three consortium igneous inclusions**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.144-149, 18 refs.

Three ordinary chondrites from the Yamato Mountains (Y) region contain cm-sized igneous inclusions which are being studied by a consortium. RNAA data for the labile elements Ag, Bi, Cd, Cs, Ga, In, Rb, Sb, Se, Te, Tl and Zn, and refractory Au and U in the L6 hosts of Y-75097 and Y-793241 indicate that each experienced at least one preterrestrial high-temperature episode. This heating occurred during formation of the igneous inclusions and/or as a result of the severe shock that affected most equilibrated L chondrites. Cosmogenic 720 ka ^{26}Al , and 301 ka ^{36}Cl (which are determined by AMS) in metal from these two meteorites and nominal terrestrial ages (based on ^{36}Cl) hint that the L6 chondrites are not paired but are inconclusive in this regard. RNAA data for the H chondrite host of Y-794046 generally resemble those of other H4-6 chondrites. Its content of cosmogenic radionuclides in general, and its ^{36}Cl content in particular, correspond to a nominal terrestrial age of 70 \pm 60 ka. (Auth.)

E-50891

Inoue, M., Nakamura, N., Kojima, H., **Preliminary study of REE abundances in chondrules, an inclusion and mineral fragments from Yamato-793321 (CM2) chondrite**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.150-163, Refs. p.160-163.

Eight spherical silicate materials (four chondrules [PO, POP and GO], one CAI, two olivine fragments and one unknown inclusion [chondrule?]) were separated from the Yamato (Y)-793321 meteorite, one of the least altered CM2 chondrites, and have been analyzed for REE, Ba, Sr, Rb, K, Ca, Mg and Fe by isotope dilution, together with petrographic examination. The olivine fragments (YO-1, YO-2) with rounded metal inclusions show depletion of alkalis, low refractory element abundances and a fractionated (V-shaped) REE pattern, indicative of solid/liquid partitioning of REE. The CAI (YI-5) consisting of olivine, fassaite and euhedral spinel shows no sign of aqueous alteration. It has low alkali and high refractory element abundances and indicates a light REE depletion and generally smooth pattern with a light/heavy REE discontinuity. The unaltered PO chondrule (YC-7) shows alkali depletion and unfractionated abundances of REE, Ba, Sr and Ca. The altered PO and GO chondrules (YC-8, YC-38) and unknown spherule (Y-9) indicate a light-REE depleted pattern with a negative Eu anomaly and low Ba, Sr and alkalis. This REE fractionation appears to be a new type for a chondrule, indicating that a unique REE fractionation occurred during the formation and/or evolution of the Y-793321 CM meteorite. (Auth. mod.)

E-50892

Shimaoka, T.K., et al, **Volatilization of alkali metals from the heated Murchison (CM2) meteorite**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.164-177, Refs. p.176-177.

In order to examine volatilization processes of alkali metals at high temperature, heating experiments were carried out using a starting material prepared from Murchison (CM2) (grain-size: 10 microns) at temperatures of 1200-1400 C under a constant pressure of 8×10^{-6} Torr, and heating duration up to 80 min. Analyses of alkalis (Na, K, Rb), major and minor elements and petrographic examinations were performed for run products. Results show that fractional volatilization of alkali metals occurred during heating. It is suggested that the volatilization rates of alkali metals are influenced by the chemical composition of partial melt. (Auth.)

E-50893

Fujimaki, H., Ishikawa, K., Aoki, K., **Rb-Sr isotopic study of Yamato-794046 chondrite and its inclusion**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.178-185, 17 refs.

The Yamato-794046 H chondrite and its inclusion were dated by the Rb-Sr method as part of a consortium study of unique inclusions in ordinary chondrites. Although the inclusion recorded an approximate 3.9 Ga melting event, the age of the impact event of the host chondrite was unclear. The inclusion is not depleted in volatile elements such as Rb and alkalis, even though the host is depleted. Therefore, when they were impacted they should have been in different places. The host might have been impacted under low confining pressures, while the inclusion was melted under relatively high confining pressures. (Auth.)

E-50894

Takaoka, N., Motomura, Y., Ozaki, K., Nagao, K., **Where are noble gases trapped in Yamato-74063 (unique)?**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.186-196, 16 refs.

Yamato-74063, a primitive achondrite with affinities to Acapulco, has been analyzed for noble gas isotopes by laser ablation mass spectrometry. Some grains released huge amounts of trapped Xe as well as trapped Ar and Kr. Among them, an orthopyroxene grain containing abundant inclusions of tiny metal spherules released equally large amounts of Xe as found for carbon residues of ureilites and carbonaceous chondrites, with $^{36}\text{Ar}/^{132}\text{Xe}=11$. In contrast, other grains including silicates, Fe-Ni metal and troilite released negligible amounts of trapped gases. Mineralogical studies of polished thin sections, prepared from the same chip as was analyzed for noble gases, indicate that the silicate grains containing the tiny metal inclusions also contain abundant tiny voids. Originally these voids must have been filled with gases or/and fluids. The authors propose bubbles as a candidate for hosts that trap large amounts of noble gases in the silicate. (Auth. mod.)

E-50895

Nagao, K., **Noble gases in hosts and inclusions from Yamato-75097 (L6), -793241 (L6) and -794046 (H5)**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.197-216, Refs. p.213-216.

Noble gas analyses for the inclusions and hosts from Yamato (Y)-75097, Y-793241 and Y-794046 have been performed. The concordant exposure ages as well as gas retention ages are observed between the host and the inclusion of each meteorite. These indicate that both experienced the same heating event and exposure history. High $^{129}\text{Xe}/^{132}\text{Xe}$ ratios (50) and neutron induced ^{80}Kr , ^{82}Kr and ^{128}Xe are due to very low concentrations of trapped noble gases in the inclusions from Y-75097 and Y-793241. This indicates a close genetic relationship and an early crystallization when ^{129}I was still alive. The inclusion of Y-794046, however, has a noble gas signature which is quite different from the other two, suggesting a different origin. Negligible amounts of radiogenic ^{129}Xe and fissiogenic ^{136}Xe suggest a late formation. (Auth.)

E-50896

Ninagawa, K., et al, **Red thermoluminescence of enstatite from the Chainpur meteorite**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.217-224, 18 refs.

For most ordinary chondrites, feldspar is mainly responsible for thermoluminescence (TL), but in type 3 ordinary chondrites, especially those which are most primitive, other minerals are important. The

authors observed red TL with a 600 nm spectral peak in an ordinary chondrite, Chainpur (LL3.4). The mineral responsible for the red TL was identified as iron-free enstatite. Spatial distribution of TL and cathodoluminescence (CL) for the same specimen was also investigated, and it was found that the red TL areas corresponded to the high-sensitivity areas of red CL. (Auth.)

E-50897

Miono, S., Nakanishi, A., **Terrestrial ages of the antarctic meteorites measured by thermoluminescence of the fusion crust: II**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.225-229, 10 refs.

The acquired doses of antarctic meteorites for dating of terrestrial ages were measured by the thermoluminescence (TL) intensity of fusion crust. It is now clearer that there is a significant correlation between the acquired dose and terrestrial age, which was previously measured by cosmogenic radionuclide abundance. Also, the ^{36}Cl method by accelerator mass spectrometry seems occasionally to indicate a great terrestrial age. (Auth.)

E-50898

Hiroi, T., Pieters, C.M., Zolensky, M.E., Lipschutz, M.E., **Possible thermal metamorphism on the C, G, B, and F asteroids detected from their reflectance spectra in comparison with carbonaceous chondrites**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.230-243, 24 refs.

Reflectance spectra (0.3-2.6 microns) of the C, G, B, and F asteroids and carbonaceous chondrites including antarctic specimens are compared in detail. Mixing calculations of 13 carbonaceous chondrite powders including three unusual CI/CM meteorites are done to characterize reflectance spectra of the 23 C, G, B, and F asteroids. Similar calculations are done with Murchison (CM2) samples heated at 400-1000 C. Each of two sets of calculations show that the C, G, G, and F asteroids may contain significant amounts of thermally metamorphosed materials. Comparison of ultraviolet absorption strengths between 160 C, G, G, and F asteroids and 21 carbonaceous chondrite powders suggests that surface minerals of most of these asteroids are thermally metamorphosed at temperatures around 600-1000 C. (Auth.)

E-50899

Ohsumi, K., et al, **Diffraction profile analysis of olivines in thin sections of meteorites by the micro-region Laue method using synchrotron radiation**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.244-251, 6 refs.

The lattice distortion of minerals included in a thin section of meteorites was measured by a newly developed X-ray technique for micro-region analysis (8 microns diameter) using synchrotron radiation. This technique using the Laue method with an imaging plate (IP) as a two-dimensional detector, as well as a micro-pinhole, was applied to olivine grains in two antarctic L6 chondrites (Y-7304 and Y-7305). The orientation matrix calculated from one end of the full width at half maximum (FWHM) along the elongated diffraction profiles is different from that based on the other end of the FWHM. Rotation about a certain axis equates one matrix to the other. The rotation angles for the Y-7304 and Y-7305 olivines were calculated to be 0.83 and 0.15 degrees, respectively, and are compatible with the FWHM of diffraction profiles. The results of the present X-ray study correspond quantitatively to the wavy extinction observed through an optical microscope. This method will be applied to analyze the lattice distortion of minerals caused by shock effects in meteorites. (Auth.)

E-50900

Kagi, H., Takahashi, K., Masuda, A., **Raman frequencies of graphitic carbon in antarctic ureilites**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.252-261, 21 refs.

Raman frequencies for the in-plane lattice vibration of graphite were surveyed for 4 antarctic ureilites in order to construct a paradigm for structural properties of graphitic carbon in ureilites. Raman spectra were obtained by point-by-point measurements using a laser microbeam 1 micron in diameter. The measured results formed an array in a two-dimensional plot between the E2g frequency and intensity ratio of two graphite-derived Raman bands. The graphitic matter in ALH-78019 gave the averaged E2g frequency which agrees with the well-established wavenumber of the E2g in-plane lattice vibration of graphite. Some graphitic matter in the ureilites (ALH-77257, Y-791538 and MET-78008) exhibited considerably up-shifted E2g frequency. Distribution in the array proved to be closely linked to the extent of shock which the ureilites experienced. (Auth.)

E-50901

Murae, T., **FT-IR spectroscopic studies of major organic matter in carbonaceous chondrites using microscopic technique and comparison with terrestrial kerogen**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.262-274, Refs. p.272-274.

Infrared (IR) absorption spectra of major types of carbonaceous matter in 4 antarctic carbonaceous chondrites (Y-74662, Y-791198, ALH-77307, Y-791717) and 2 non-antarctic carbonaceous chondrites (Murchison, Allende) were taken using a microscopic FTIR technique. Without any treatment for concentration of carbon, powdered samples of carbon-rich C2 chondrites such as Y-74662, Y-791198 and Murchison yielded spectra of the carbonaceous matter with enough intensity by focusing the beam on carbonaceous aggregates. Carbon-poor C3 chondrites (ALH-77307, Y-791717, and Allende) needed carbon enrichment by acid treatment to give IR spectra of carbonaceous matter of adequate intensity. The IR spectra indicated the presence of similar functional groups in the major types of carbonaceous matter of all the investigated chondrites. Some natural coals (typical terrestrial kerogen) show very similar IR spectra to the carbonaceous matter of carbonaceous chondrites. (Auth.)

E-50902

Scorzelli, R.B., Galvão da Silva, E., Souza Azevedo, I., Tomeoka, K., **Fe-bearing phases in antarctic carbonaceous chondrites Yamato-82162 and Yamato-86720: a Mössbauer study**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.275-283, 14 refs.

Results of variable temperature Mössbauer spectroscopy measurements on samples of Y-82162 and Y-86720 carbonaceous chondrites are reported. Transmission Mössbauer spectra were taken through the temperature range from 4.2 K to 300 K. The Mössbauer spectra at room temperature clearly indicate the presence of magnetic splits and quadrupole doublets in both meteorites, which can be attributed to troilite and olivine, respectively. The measurements also indicate the presence of a superparamagnetic component, probably ferryhidrite, in Y-86720 but not in Y-82162. These results are mostly consistent with those obtained by mineralogical studies. However, the Mössbauer measurements indicate the presence of a previously unknown magnetic component having a field of 250 kOe in both meteorites; the mineral is so far unidentified. This study supports the view that these meteorites were affected by thermal metamorphism, and that Y-82162 was less thermally metamorphosed than Y-86720. (Auth.)

E-50903

Maurette, M., Kurat, G., Perreau, M., Engrand, C., **Microanalyses of Cap-Prudhomme antarctic micrometeorites, Microbeam analysis**, Sep./Oct. 1993, 2(5), p.239-251, 40 refs.

The antarctic ice sheet is an inexhaustible and ultraclean collector of "unmelted" micrometeorites (AMMs) of both chondritic and nonchondritic composition. In Jan. 1991, several tens of thousands of AMMs measuring 25-500 microns were recovered from 260 tons of antarctic ice meltwater. They survive unexpectedly well upon atmospheric entry. Since they are generally heterogeneous aggregates of very small grains, their analysis is a difficult challenge, requiring microanalyses at all scales of magnification. So far, only dark-irregular-chondritic AMMs (dark-AMMs) have been investigated in detail. They show similarities

but also differences with the rare meteorite class of CM carbonaceous chondrites and with approximately 10 microns size interplanetary dust particles (IDPs) collected in the stratosphere. The AMMs and, to a lesser extent, IDPs show some alterations due to terrestrial processes that appear as depletion and/or enrichment of some minor and trace elements in their fine-grained matrix. (Auth. mod.)

E-50904

Scorzelli, R.B., Pereira, R.A., Perez, C.A.C., Fernandes, A.A.R., **Fe-Ni alloys in a unique antarctic meteorite: Yamato-791694**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.293-298, 11 refs.

Phase composition and structure of iron-nickel alloys in antarctic Y-791694 are discussed and compared to other non-antarctic Ni-rich ataxites using the results obtained by Mössbauer spectroscopy and X-ray diffraction. (Auth.)

E-50905

Scorzelli, R.B., et al, **Mössbauer spectroscopy study of the metallic particles extracted from the antarctic chondrite Allan Hills-769**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.299-303, 10 refs.

Pieces of the antarctic L6 chondrite Allan Hills-769 (ALH-769) were subjected to magnetic and chemical separation in order to obtain small metallic grains of the special ordered crystal structure of AuCu-type tetrataenite. The samples have been analyzed in each step of preparation by Mössbauer spectroscopy and other techniques. (Auth.)

E-50906

Doubleday, P.A., et al, **Allochthonous oceanic basalts within the Mesozoic accretionary complex of Alexander Island, Antarctica: remnants of proto-Pacific oceanic crust**, *Journal of the Geological Society*, Jan. 1994, 151(1), p.65-78, 66 refs.

The Mesozoic LeMay Group accretionary complex of Alexander I. contains thrust-bound slices of accreted ocean floor, ocean islands and seamounts. They represent fragments of proto-Pacific oceanic crust, of which only a tiny remnant (the Phoenix plate) remains off northern Antarctic Peninsula. They therefore provide an excellent opportunity to sample the ancient oceanic crust that formerly occupied the southern Pacific Ocean. All the basalts experienced sea-floor and subduction/accretion metamorphism ranging from zeolite to transitional blueschist facies. On the basis of rare-earth and other immobile trace element characteristics, the basalts are divided into depleted MORB, N-MORB, E-MORB, and tholeiitic and alkaline OIB. Oceanic basalts occur within two rock associations on Alexander I., basalt-volcaniclastite-chert and basalt-volcaniclastite-tuff. The basalt-volcaniclastite-chert rock association is dominated by pillow lavas which have light REE-depleted N-MORB geochemical characteristics, and is interpreted as representing ocean floor formed at spreading centers. Locally, sills of tholeiitic OIB intrude the sequence. The basalt-volcaniclastite-tuff rock association exposed in the Lully Foothills was formed in shallow water during the Early Jurassic. It is geochemically varied, consisting of basalts with N-MORB, E-MORB and tholeiitic OIB characteristics. The association is interpreted to have been formed on a large seamount or ocean island. (Auth.)

E-50907

Simonov, I.M., et al, **Integrated natural-scientific investigations in the Untersee and Obersee Lakes area, central Dronning Maud Land, Antarctica** [Komplexe naturwissenschaftliche Untersuchungen am Unter- und Obersee, zentrales Dronning-Maud-Land, Antarktika], *Petermanns geographische Mitteilungen*, Apr. 1985, 129(2), p.125-135, In German with English, German, and Russian summaries following p.156. 12 refs.

Subsurface contour maps from Lake Untersee and Lake Obersee obtained from many soundings and measurements of albedo and temperature allow statements to be made of the water dynamics of these virtually unknown lakes. Hydrochemical measurements show distinct

differences in nutrient content, total mineralization, and pH values of the analyzed waters. They are related to varying hydrodynamic conditions and changes in the surrounding rock types. The geological field work allows the subdivision of the anorthosite massif into three series, permits descriptions of deformation history, and shows the occurrence of two mineralized inclusions. Glaciomorphological and biological observations complete the investigations. (Auth. mod.)

E-50913

Frezzotti, M.L., Di Vincenzo, G., Ghezzi, C., Burke, E.A.J., **Evidence of magmatic CO₂-rich fluids in peraluminous graphite-bearing leucogranites from Deep Freeze Range (northern Victoria Land, Antarctica)**, *Contributions to mineralogy and petrology*, July 1994, 117(2), p.111-123, 71 refs.

Fine-grained peraluminous synkinematic leuco-monzogranites (SKG) of Cambro-Ordovician age occur as veins and sills (up to 20-30 m thick) in the Deep Freeze Range, within the medium to high-grade metamorphics of the Wilson Terrane. Secondary fibrolite+graphite intergrowths occur in feldspars and subordinately in quartz. Four main solid and fluid inclusion populations are observed. The SKG crystallized from a magma that was at some stage vapor-saturated CO₂-rich fluids (+/- brines) characterize the transition from magmatic to post-magmatic stages. Progressive isobaric cooling (T<670 °C) led to a continuous decrease of f_{O2} entering in the graphite stability field; at the same time, the feldspars reacted with CO₂-rich fluids to give secondary fibrolite+graphite. Decrease of T and f_{O2} can explain the progressive variation in the fluid composition from CO₂-rich to CH₄- and water-dominated in a closed system (*in situ* evolution). The presence of N₂ in the late stages indicates interaction with external metamorphic fluids. (Auth. mod.)

E-50914

Hole, M.J., LeMasurier, W.E., **Tectonic controls on the geochemical composition of Cenozoic, mafic alkaline volcanic rocks from West Antarctica**, *Contributions to mineralogy and petrology*, July 1994, 117(2), p.187-202, 82 refs.

Cenozoic, mafic alkaline volcanic rocks throughout West Antarctica (WA) occupy diverse tectonic environments. On the Antarctic Peninsula (AP), late Miocene-Pleistocene (7 to <1 Ma) alkaline basaltic rocks were erupted <1 to 45 million years after subduction ceased along the Pacific margin of the AP. In Marie Byrd Land (MBL), by contrast, alkaline basaltic volcanism has been semi-continuous from 25-30 Ma to the present, and occurs in the West Antarctic rift system. Basaltic rocks throughout WA have uniform geochemical characteristics, with especially narrow ranges in initial ⁸⁷Sr/⁸⁶Sr, ¹⁴³Nd/¹⁴⁴Nd, and La/Nb ratios. However, there are significant differences in the relative and absolute abundances of the LILE (large-ion-lithophile elements), and these divide WA into two provinces. This geochemical contrast is accompanied by a three-fold increase in the age range of volcanic activity and a three orders of magnitude increase in the volume of eruptive products within MBL. Most MBL geochemical traits are shared by the volcanic rocks of the western Ross Sea, suggesting that a large plume head underlies the West Antarctic rift system. The uniformity of basalt compositions throughout WA and the entire rift system suggest uniformly minimal extension throughout this region during late Cenozoic time. (Auth. mod.)

E-50958

Wang, Y.X., Shen, Y.B., Yang, J.D., **Characteristics of Nd and Sr isotopes and trace elements for Late Cretaceous volcanic rocks on King George Island, Antarctica: implications for source of the volcanics from depleted mantle**, *Antarctic research*, June 1993, 4(1), p.12-25, Refs. p.24-25.

Rb-Sr isotopic isochron dating of volcanic rock samples from the Upper Cretaceous Half Three Point Formation on King George I. is 71.33 Ma. Of the samples, 6 were given a mean Sm-Nd model age of 443.3 +/- 20.6 Ma, possibly indicating the age of chemical variation events in the magma source of the study area. Features of trace elements indicated that the rocks from the Half Three Point Formation are of typical calc-alkaline volcanic suite and are similar to those from the Tertiary volcanic rocks of Fildes Peninsula, being products of the island-arc volcanic activity. (Auth.)

E-50959

Fu, Y.L., et al, $^{40}\text{Ar}/^{39}\text{Ar}$ isotopic dating the biotites from the igneous and metamorphic rocks of the Zhongshan Station area, *Antarctic research*, June 1993, 4(1), p.26-34, 8 refs.

Zhongshan Station is located in the Larsemann Hills, East Antarctica. Low pressure granulite facies gneisses together with late granites are outcropped in the region. Three biotite samples from a garnet segregation, a syenogranite and a granite-pegmatite were measured with $^{40}\text{Ar}/^{39}\text{Ar}$ incremental heating technique. Biotites from the garnet segregation give an $^{40}\text{Ar}/^{39}\text{Ar}$ plateau age of 504 Ma. Biotites from the syenogranite yield an $^{40}\text{Ar}/^{39}\text{Ar}$ plateau age of 494 Ma. Biotites from the granite-pegmatite give an $^{40}\text{Ar}/^{39}\text{Ar}$ plateau age of 486 Ma. They verify the 500 Ma thermal event called "Pan African event" by previous K-Ar and Rb-Sr data. These are cooling ages of the biotites when the paleogeotherm of the area dropped to the K-Ar closure temperature for biotite. (Auth.)

E-50973

Ren, L.D., Liu, X.H., Occurrence of the assemblage grandidierite, kornerupine, and tourmaline in Antarctica, *Antarctic research*, Dec. 1993, 4(2), p.21-28, 18 refs.

Grandidierite, kornerupine and tourmaline occur in high-grade pelitic gneisses from the Larsemann Hills, East Antarctica. The three minerals are connected to each other and show a special order: $\text{Trn}_1\text{-Gdd-}\text{Trn}_2\text{-Krn-}\text{Trn}_3$, suggesting that the occurrence of the assemblage is controlled by the temporal changes of the chemical potentials of B_2O_3 and H_2O . The discovery of the assemblage is a good constraint on the setting and composition features of metamorphism in the area. (Auth.)

E-50986

DiVenere, V.J., Kent, D.V., Dalziel, I.W.D., Mid-Cretaceous paleomagnetic results from Marie Byrd Land, West Antarctica: a test of post-100 Ma relative motion between East and West Antarctica, *Journal of geophysical research*, Aug. 10, 1994, 99(B8), p.15,115-15,139, Refs. p.15,136-15,139.

In 1990-1991, oriented samples were collected for paleomagnetic analysis from mid-Cretaceous (ca 100 Ma) intrusive rocks at sampling localities across 350 km of the Ruppert and Hobbs Coast area of Marie Byrd Land. Paleomagnetic results are presented along with several lines of evidence, including a positive tilt test based on the attitude of ca 117 Ma volcanic rocks that the 100 Ma rocks intrude, which argue that these results are a representative estimate of the mid-Cretaceous magnetic field in Marie Byrd Land. The new 100 Ma mean south pole is concordant with other West Antarctic results of similar age, implying that at least Marie Byrd Land, Thurston I. and the Antarctic Peninsula have not experienced any paleomagnetically resolvable relative motion since the mid-Cretaceous. However, the poles from these Pacific-bordering blocks of West Antarctica are significantly offset from a synthetic apparent polar wander path that was produced for the East Antarctic craton, implying relative movement between East Antarctica and Pacific West Antarctica since about 100 Ma. (Auth. mod.)

E-50988

Vtiurin, B.I., Contemporary periglacial environment in the polar regions, *Polar geography and geology*, Jan.-Mar. 1994, 18(1), p.44-62, Refs. p.59-62.

The present-day periglacial zones of the polar regions in both hemispheres have many features in common, caused by the peculiarities of climate, glaciological and geocryological processes, and the geomorphology of the periglacial regions. On the other hand, there exist essential differences in the general appearance of the periglacial zones in the Northern and Southern hemispheres, related mainly to particular features of continental glaciation. An analysis of the literature and of data from the author's field observations have allowed him to reach some conclusions as to the major features of the geocryology of the polar regions: the thickness, distribution, temperature, and cryogenic structure of the permafrost and of seasonally frozen materials, and the ground ice and cryogenic relief of these areas. This in turn has made it possible to identify a geocryological zonation of the polar regions and to advance a new concept as to the present-day periglacial zone. (Auth.)

E-51002

Rodgers, K.A., Gregory, M.R., Barton, R., Bayerite, nord-

strandite, gibbsite, brucite, and pseudoboehmite in discharged caustic waste from Campbell Island, southwest pacific, *Clays and clay minerals*, 1991, 39(1), p.103-107, 23 refs.

Rodgers *et al.*, (1989) described a deposit of bayerite [$\text{B-Al}(\text{OH})_3$] on subtropical Raoul I. which resulted from discharge of spent caustic solutions used to produce hydrogen at a meteorological station. In the few samples available for study, no other aluminum hydroxide phases were recognized. Subsequently, two small collections of specimens from a similar discharge on subantarctic Campbell I. were obtained from the New Zealand Department of Conservation. A preliminary X-ray powder diffraction examination indicated that although bayerite was the principal constituent here also, gibbsite and nordstrandite were probably present. Additional study of the samples was undertaken to confirm the presence of all three polymorphs and to ascertain if these mineralogical differences were significant. The two deposits have developed under distinctly different climatic regimes. (Auth.)

E-51004

Oberbeck, V.R., Marshall, J.R., Aggarwal, H., Impacts, tillites, and the breakup of Gondwanaland, *Journal of geology*, Jan. 1993, 101(1), p.1-19, 69 refs.

Mathematical analysis demonstrates that substantial impact crater deposits should have been produced during the last 2 Gy of Earth's history. Textures of impact deposits are shown to resemble textures of tillites and diamictites of Precambrian and younger ages. The calculated thickness distribution for impact crater deposits produced during 2 Gy is similar to that of tillites and diamictites up to 2 Ga. The authors suggest, therefore, that some tillites/diamictites could be of impact origin. Extensive tillite/diamictite deposits predated continental flood basalts on the interior of Gondwana. Significantly, other investigators have already associated impact cratering with flood basalt volcanism and continental rifting. It is proposed that the breakup of Gondwana could have been initiated by crustal fracturing from impacts. (Auth.)

E-51005

Young, G.M., Impacts, tillites, and the breakup of Gondwanaland: a discussion, *Journal of geology*, Sep. 1993, 101(5), p.675-679, 38 refs. For the material under discussion see E-51004.

Oberbeck *et al.* (1993) proposed that some ancient sedimentary rocks such as diamictites and associated deposits, widely interpreted as glaciogenic, should be reassessed in the light of recent advances in the understanding of impact-related phenomena. Such radical departures from accepted interpretations can stimulate review of long-accepted, more traditional ideas and thus provide a catalyst for new avenues of research. The proposed reinterpretations have potentially far-reaching consequences. For example, the possible connections between long-term climatic change and tectonic history of the earth would be brought into question. Some aspects of atmospheric evolution, interpretation of stable isotope distribution curves, and ideas on the evolution of life have been linked to inferences about cold climatic episodes, glaciations, based primarily on study of the rock record. In the last two decades, following publication of the benchmark paper by Schermerhorn (1974), glacial specialists have been particularly circumspect in their interpretations and have developed what they consider to be a reliable set of criteria for the recognition of glacial deposits. The author suggests that the proposed impact theory for the origin of many diamictite-bearing sequences is correspondingly suspect. (Auth.)

E-51006

Oberbeck, V.R., Marshall, J.R., Aggarwal, H., Impacts, tillites, and the breakup of Gondwanaland: a reply, *Journal of geology*, Sep. 1993, 101(5), p.679-683, 16 refs. For the material being discussed see E-51005.

In a discussion, it was concluded that the hypothesis for the impact origin for some tillite/diamictite deposits should be considered suspect. It is reasoned here that the hypothesis should be considered no more suspect than the classic glacial hypotheses for origin of some tillites/diamictites or Schermerhorn's (1974) tectonic hypothesis for their origin. All hypotheses are suspect until predictions based on those hypotheses are made and tested. There are unique criteria for recognition of shock meta-

morphism produced in minerals beneath impact sites. There are no criteria, however, which are as unique to glaciation or tectonism as shock metamorphism is to impact, that are available to test the hypotheses of glacial or tectonic origin for each tillite/diamictite deposit. Thus, tillite/diamictites may not be as reliably tested for glacial or tectonic origin as for impact origin. The discussion, together with the reply, should now prompt a search for predicted impact shock metamorphism in the tillite/diamictites; this may permit the possibility of opening a new fruitful area of research which the discussion acknowledges can sometimes result from radical departures from conventional wisdom. (Auth. mod.)

E-51007

Le Roux, J.P., **Impacts, tillites, and the breakup of Gondwanaland: a second discussion**, *Journal of geology*, July 1994, 102(4), p.483-485, 28 refs. For the material being discussed see E-51004.

The purpose of this discussion is to review some of the evidence indicating that in the Karoo (Gondwana) Basin of South Africa, (a) the Dwyka Formation is predominantly of glacial origin, and (b) the Cape fold belt cannot be the result of a single bolide impact. Following the presentation of half a dozen elements of this evidence, the conclusion is reached that the field evidence indicating a glacial origin for the Dwyka Formation and a tectonic origin for the Cape fold belt is overwhelming, so until some real evidence for bolide impacts emerges, the hypotheses proposed by Oberbeck et al. (1993) will remain pure speculation.

E-51008

Oberbeck, V.R., Hörz, F., Bunch, T., **Impacts, tillites, and the breakup of Gondwanaland: a second reply**, *Journal of geology*, July 1994, 102(4), p.485-489, 25 refs. For material being discussed see E-51007.

The conclusions reached in the second discussion are rebutted by means of additional evidence from other locations supporting the original thesis of an impact origin for some of the Gondwana tillites and flood basalts. It is also emphasized that the impact origin hypothesis did not exclude a glacial origin for other Gondwana tillites; both glacial and impact processes may have been involved.

E-51075

Campbell, I.B., Claridge, G.G.C., Balks, M.R., **Effect of human activities on moisture content of soils and underlying permafrost from the McMurdo Sound region, Antarctica**, *Antarctic science*, Sep. 1994, 6(3), p.307-314, 5 refs.

Soils and the underlying permafrost from undisturbed sites and sites that had been disturbed by construction activities at Marble Point and Pram Point were sampled from excavated pits and drill cores. Gravimetric moisture (ice) contents and particle size distribution were determined. Volumetric moisture contents were calculated from these results. At undisturbed sites, soil moisture contents within the active layer (to c. 60 cm depth) were low and ranged from 0.5% by weight at the soil surface to 10% above the permafrost. The permafrost was generally completely saturated with ice, but sometimes contained considerable excess ice, with ice contents rising as high as 80% by volume. At disturbed sites, soil moisture contents within the active layer were similar to those of the undisturbed sites (generally <10% by weight) but within the permafrost, moisture contents were lower and less variable than in the undisturbed sites, rarely exceeding 20% by weight. The release of considerable quantities of water from the permafrost as a result of land disturbance during construction activities caused stream flows, soil shrinkage, land slumping and salinization, resulting in significant permafrost environmental damage. At Marble Point there has been no significant re-establishment of icy permafrost in the disturbed soils in the 30 years since land disturbance occurred. (Auth.)

E-51082

Beliatskii, B.V., Laiba, A.A., Mikhalskii, E.V., **U-Pb zircon age of the metavolcanic rocks of Fisher Massif (Prince Charles Mountains, East Antarctica)**, *Antarctic science*, Sep. 1994, 6(3), p.355-358, 14 refs.

Fisher Massif is believed to represent less metamorphosed portions of an extensive Proterozoic mobile belt, and is composed of metavolcanic rocks of different compositions and numerous intrusive bodies. U-

Pb dating of six zircon fractions recovered from metavolcanic rocks of intermediate to acidic compositions defines growth time at c. 1300 Ma with notable Pb losses at 364 Ma and in recent time. Grain morphologies do not provide unequivocal genetic evidence, but an igneous origin for the grains studied is the most probable. The dates obtained probably reflect igneous activity to be co-eval with mafic dyke emplacement events elsewhere in ancient East Antarctic cratonic blocks. (Auth.)

E-51083

Damaske, D., et al, **Transfer faults in the western Ross Sea: new evidence from the McMurdo Sound/Ross Ice Shelf aeromagnetic survey (GANOVEX VI)**, *Antarctic science*, Sep. 1994, 6(3), p.359-364, 19 refs.

Aeromagnetic data collected on the GANOVEX IV and GANOVEX VI expeditions are combined in this report to give a synoptic view of the western Ross Sea. The addition of the new GANOVEX VI data allows the identification of the southern boundary of the "Ross Sea Unit"—a magnetic unit containing rift-fabric anomalies of the West Antarctic rift system in the Victoria Land basin. Although this boundary has a similar WSW-ENE orientation to the northern boundary, as identified in the GANOVEX IV survey, the newly identified southern magnetic unit (called the "Ross Island and Ice Shelf Edge Unit") includes evidence of the S-N rift-fabric that is not found in the north, i.e. the rift-fabric continues farther south. The linear boundaries themselves are interpreted to be transfer faults, as proposed by previous workers on the tectonic development of the Ross Sea area. (Auth. mod.)

E-51084

Leat, P.T., Scarrow, J.H., **Central volcanoes as sources for the Antarctic Peninsula Volcanic Group**, *Antarctic science*, Sep. 1994, 6(3), p.365-374, Refs. p.373-374.

From at least the Early Jurassic to the Miocene, eastward subduction of oceanic crust took place beneath the Antarctic Peninsula. Magmatism associated with the subduction generated a N-S linear belt of volcanic rocks known as the Antarctic Peninsula Volcanic Group (APVG), and which erosion has now exposed at about the plutonic/volcanic interface. Large central volcanoes from the APVG are described here for the first time. The structures are in northwest Palmer Land within the main Mesozoic magmatic arc. One center, Zonda Towers, is recognized by the presence of a 160 m thick silicic ignimbrite containing accidental lava blocks up to 25 m in diameter. This megabreccia is interpreted as a caldera-fill deposit which formed by landsliding of steep caldera walls during ignimbrite eruption and deposition. A larger center, Mount Edgell-Wright Spires, is dominated by coarse-grained debris flow deposits and silicic ignimbrites which, with minor lavas and fine-grained tuffs, form a volcanic succession some 1.5 km thick. Basic intermediate and silicic sills c. 50 m thick intrude the succession. A central gabbro-granite intrusion is interpreted to be a high-level magma chamber of the Mount Edgell volcano. (Auth.)

E-51085

Melles, M., Verkulich, S.R., Hermichen, W.D., **Radiocarbon dating of lacustrine and marine sediments from the Bunger Hills, East Antarctica**, *Antarctic science*, Sep. 1994, 6(3), p.375-378, 16 refs.

Radiocarbon dating was carried out on the total organic carbon of 19 lacustrine and marine sediment samples from the Bunger Hills. The results indicate that radiocarbon contamination is negligible throughout two sediment sequences from a fresh-water lake. In contrast, two sequences from marine basins are irregularly influenced by the Antarctic Marine Reservoir Effect, which today amounts to more than 1000 years, depending on the degree of dilution with meltwater. All dated sediments were deposited during Holocene time. (Auth.)

E-51086

Sims, J.P., Dirks, P.H.G.M., Carson, C.J., Wilson, C.J.L., **Structural evolution of the Rauer Group, East Antarctica: mafic dykes as passive markers in a composite Proterozoic terrain**, *Antarctic science*, Sep. 1994, 6(3), p.379-394, Refs. p.393-394.

Archaean gneisses in the Rauer Group of islands, East Antarctica, record a prolonged history of high-grade deformational episodes, many of which predate that identified in mid-Proterozoic gneisses. Eleven

generations of mafic dykes belonging to discrete chemical suites have been used as relative time markers to constrain this deformational history. Based on the timing of intrusion with respect to structures, dykes in the Rauer Group have been correlated with largely undeformed and dated dyke suites in the adjacent Vestfold Hills. This has allowed absolute ages to be inferred for the early- to mid-Proterozoic mafic dyke suites in the Rauer Group, and a correlation of the interspersed structural events. Most structures in the Rauer Group, however, developed in response to high-grade progressive deformation at approximately 1000 Ma. During this deformational episode, strains were repeatedly partitioned into sub-vertical, noncoaxial high-strain zones recording NW-directed sinistral transpression, that separated zones of lower strain dominated by coaxial folding with axes parallel to the shear direction. (Auth. mod.)

E-51087

Verkulich, S.R., Hiller, A., **Holocene deglaciation of the Bunger Hills revealed by ^{14}C measurements on stomach oil deposits in snow petrel colonies**, *Antarctic science*, Sep. 1994, 6(3), p.395-399, 12 refs.

Solidified stomach oil deposits in snow petrel colonies in the Antarctic proved to be suitable for ^{14}C dating and provide important palaeobiogeographical and palaeoenvironmental information. Following earlier studies in Lake Unter-See, the authors present ^{14}C measurements on comparable deposits from the Bunger Hills. The conventional ^{14}C age of the basal layer reflects the occupation age of any particular nesting site and therefore a minimum age for the time when this area became ice-free. According to the ^{14}C results the occupation of the southern part of the Bunger Hills by petrels started about 10,000 yr ago. The breeding colonies expanded continuously following local ice retreat. The most intensive phases of colonization seem to have been from 8-6 kyr BP and during the past 2 kyr. (Auth.)

E-51088

Willan, R.C.R., Pankhurst, R.J., Hervé, F., **Probable Early Triassic age for the Miers Bluff Formation, Livingston Island, South Shetland Islands**, *Antarctic science*, Sep. 1994, 6(3), p.401-408, Refs. p.407-408.

Fifteen samples of very low-grade mudstones from two widely separated sections in the Miers Bluff Formation on Hurd Peninsula yield an Rb-Sr errorchron (MSWD=8.9) corresponding to an age of 243 ± 8 Ma. This age is interpreted as representing effective homogenization, on a kilometers scale, during turbidite deposition and diagenesis in early Triassic times. The initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of 0.7085 represents a mature crustal source and is consistent with the re-working of material comparable to that eroded from the Chilean fore-arc accretionary complex. Four further samples, collected near a zone of quartz-carbonate veins, lie to the right of the errorchron, with two samples having unusually low Sr contents. These samples fall on a 113 Ma reference line and indicate metasomatic disturbance in Cretaceous times. Metasomatism was probably related to hydrothermal alteration accompanying widespread silicification and quartz veining on western Hurd Peninsula. A mid- to late Cretaceous age for metasomatic disturbance agrees with field relations which indicate that the hydrothermal activity preceded or was coeval with the mid- to late Cretaceous period of volcanism on Livingston I. Hence the hydrothermal rocks are not related to the Eocene Barnard Point pluton, as previously suggested. (Auth.)

E-51089

McCarron, J.J., **Stratigraphical observations on the Tertiary calc-alkaline volcanic sequences in Alexander Island**, *Antarctic science*, Sep. 1994, 6(3), p.409-410, 9 refs.

Stratigraphical correlations among the Colbert Mountains, Elgar Uplands and Finlandia Foothills on Alexander I. are difficult to establish. However, there are broad lithological similarities among the three major outcrop areas, which form the basis for the relationships shown in a figure. In particular, thick sequences of porphyritic lavas are present in all areas, and at least two erosional unconformities divide similar-looking sequences in western outcrops in the Colbert Mountains and Elgar Uplands. Geochronological and geochemical studies in progress will help to constrain the stratigraphy. These are essential prerequisites for understanding temporal changes in magma chemistry, and their relationship to regional tectonic processes. (Auth. mod.)

E-51094

Moyes, A.B., **Age and origin of the Jutulssessen granitic gneiss, Gjelsvikfjella, Dronning Maud Land, South Africa**, *Journal of antarctic research*, 1993, 23(1 & 2), p.25-32, 21 refs.

Rb-Sr and Sm-Nd whole-rock data are presented for the Jutulssessen granitic gneiss, deformed intrusive mafic dykes, and cross-cutting pegmatites and aplites. The data indicate that Nd-isotopic homogenization last occurred at ca. 1,153 Ma, whereas Sr-isotopic homogenization last occurred at ca. 535 Ma. Both ages are significant in that they correspond to widely recognized periods of tectonothermal activity, namely the latest Kibaran orogeny and the late Ross (or Pan-African) orogeny. The age discrepancy is attributed to isotopic decoupling of the Rb-Sr system from the Sm-Nd system during the Late Cambrian. The intrusive age of the Jutulssessen granitic suite is interpreted to be ca. 1,153 Ma, and the combined Sr and Nd data suggest that it was derived from a mantle-type source (I-type), or from juvenile sediments with short crustal residence times. The isotopic data also imply that the observed structural D₁ and D₂ events at Jutulssessen are Proterozoic in age, while the D₃ event is Late Cambrian. (Auth. mod.)

E-51110

Elliot, D.H., Askin, R.A., Kyte, F.T., Zinsmeister, W.J., **Iridium and dinocysts at the Cretaceous-Tertiary boundary on Seymour Island, Antarctica: implications for the K-T event**, *Geology*, Aug. 1994, 22(8), p.675-678, 27 refs.

A single iridium anomaly (40 times background concentration), correlated with the Cretaceous-Tertiary (K-T) boundary, is present within an interval of unconsolidated glauconitic silty sands in a marine clastic sequence on Seymour I. Dinocysts provide the basis for biostratigraphic identification of a 20-30 cm K-T transitional interval; calcareous microfossils have not been preserved in the glauconitic beds. Dinocysts also record an earliest Danian transgressive event 10 cm above the transition interval. The Ir spike is near the base of the dinocyst transition interval and 30 cm below the flooding horizon. The Seymour I. site, located at a high latitude (63S) at the end of the Cretaceous, provides no compelling evidence for mass extinction at the K-T boundary. (Auth.)

E-51111

Shibuya, K., et al, **Application of GPS differential positioning for the development of the antarctic penetrator**, *Journal of physics of the earth*, 1993, 41(5), p.291-304, 5 refs.

To study the effectiveness of GPS (Global Positioning System) differential positioning for the deployed antarctic penetrator, fall tests were made by changing the release altitude at 160, 330, 680, and 1,000 m above the ground. A two-blade helicopter equipped with a Trimble GPS Pathfinder was used in the experiment in Hokkaido in Apr. 1991. As compared with the precise location determined by the GPS doubly differenced phase analysis, post-processed 1 min average of the helicopter hovering GPS differential navigation data was accurate to 10 m for a horizontal location. By knowing the release time to an accuracy of 1 s, the impact location can be predicted by tracing the falling trajectory. Thus estimated position was accurate to 30 m against the precise location. As for height accuracy, there was an error of ± 10 m in the hovering method. This error further degraded to ± 20 m when the coordinates of the reference site were replaced by a time-average of the point-positioning results. These positioning accuracies are enough for long-range (300 km profile) seismic explosion experiments with 5-10 km station separation, because the associated errors result only in 0.2% uncertainty in the estimate of P-wave velocity structures. (Auth. mod.)

E-51118

Osborn, J.M., Taylor, T.N., **Pollen morphology and ultrastructure of the Corystospermales: permineralized *in situ* grains from the Triassic of Antarctica**, *Review of palaeobotany and palynology*, July 1994, 82(3/4), p.365 + one corrected page, For the paper being corrected, see E-49837.

Due to technical faults in production, Plate V (p.216) of the original paper unfortunately was printed out of focus; also the righthand side of the plate was cropped too much, consequently the saccus illustrated in fig. 6 is not complete in the published version. The correct version of Plate V follows this page. (Auth. mod.)

E-51120

MacLeod, N., Keller, G., **Comparative biogeographic analysis of planktic foraminiferal survivorship across the Cretaceous/Tertiary (K/T) boundary**, *Paleobiology*, Spring 1994, 20(2), p.143-177, 92 refs.

Recent isotopic data from some Cretaceous plankton species indicate that, at least in these instances, the widely recognized "reworking" hypothesis is false. To further test this reworking hypothesis, the biogeography of this "Cretaceous" fauna is compared to the underlying uppermost Maastrichtian biogeography and to the biogeography of the lowermost Danian planktic foraminiferal faunas. Results show that there is no regular decline in species richness, extinction, or faunal co-occurrence values for this "Cretaceous" fauna at progressively higher (=younger) Danian stratigraphic horizons. Instead, there is, between the Cretaceous and Danian speciation, a close association throughout the lower Danian, a close numerical and geographic correspondence, and pronounced similarities in biogeographic structures. These data suggest that the K/T planktic foraminiferal extinction event exhibited a marked geographic structure with high-latitude survivor faunas persisting more or less unchanged into the overlying zone, P1b and P1c. Taken together, these results challenge the traditional concept of an instantaneous uppermost Cretaceous planktic foraminiferal mass extinction and its proposed causal connection to bolide impact. Antarctic data involved in this study come from cores taken at ODP Site 690 in the Weddell Sea and at ODP Site 738 in the Kerguelen Plateau. (Auth. mod.)

E-51121

Long, D.J., **Quaternary colonization or Paleogene persistence: historical biogeography of skates (Chondrichthyes: Rajidae) in the antarctic ichthyofauna**, *Paleobiology*, Spring 1994, 20(2), p.215-228, 77 refs.

Seven endemic species of skates (Chondrichthyes: Rajidae) represent the only family of elasmobranchs currently known to live in antarctic continental waters. Recent fossil material collected from the middle Eocene of Seymour I. indicates that they may have persisted in antarctic waters since the Paleogene. A revised dispersal scenario, based on skate fossils, biology, paleogeography, and present centers of skate diversity, suggests that skates evolved in the western Tethys and North Boreal seas of western Europe in the Late Cretaceous and early Paleogene and emigrated into Antarctica during the early to middle Eocene via a dispersal corridor along the continental margins of the western Atlantic Ocean. Skates probably populated the Pacific Basin by passing from this dispersal corridor through the Arctic Ocean. Vicariant events, such as opening of the Drake Passage, the development of the Circum-Antarctic Current, and formation of deep and wide basins around Antarctica prevented movement of other species into Antarctica from northern areas. Skates are the only group of fishes known to have survived the Oligocene cooling of Antarctica that killed or extirpated the Paleogene ichthyofauna; they persisted by a combination of cold tolerance, generalized diet, and unspecialized bathymetric and habitat preferences. (Auth. mod.)

E-51122

Doyle, P., Macdonald, D.I.M., **Belemnite battlefields, Lethaia**, Mar. 15, 1993, 26(1), p.65-80, Paper presented at the International Cephalopod Symposium, 3rd, Lyon, France, 1990. 68 refs.

Mass accumulation of belemnite rostra ('belemnite battlefields') are common in Mesozoic sediments, and accumulations of belemnoids are also known from older rocks. Many Recent teuthid species suffer mortality immediately after spawning, and some authors have suggested that belemnite accumulations record a similar phenomenon. Conversely, it is clear that many belemnite battlefields actually formed in an environment of net sediment loss, with current alignment and winnowing. A proposed model for the production of belemnite battlefields involves five possible pathways: post-spawning mortality, catastrophic mass mortality, predation concentration, stratigraphical condensation, and resedimentation. Although accumulations that have not been reworked are rare, it is possible to recognize the generating agents of belemnite accumulations through their intrinsic features. A genetic classification of belemnite battlefields, based on the identified pathways, is tested through field examples in Britain and Antarctica, as well as through published examples. (Auth.)

E-51164

Barrera, E., Tevesz, M.J.S., Carter, J.G., McCall, P.L., **Oxygen and carbon isotopic composition and shell microstructure of the bivalve *Laternula elliptica* from Antarctica**, *Palaeos*, June 1994, 9(3), p.275-287, Refs. p.286-287.

Oxygen and carbon isotopic measurements were obtained from microsamples of an adult *Laternula elliptica* an infaunal aragonitic antarctic bivalve. The $\delta^{18}\text{O}$ values of samples from the exterior surface are, on average (about 4.5 per mill), similar to calculated values inferred to represent precipitation in equilibrium with ambient environmental conditions. This indicates that bulk samples as well as many microsamples from the exterior surface could provide reliable isotopic estimates of paleotemperatures and paleosalinities. Comparison of isotopic compositions of aragonitic *L. elliptica* with the calcitic bivalve *Adamussium colbecki* collected at the same location and time demonstrates an ^{18}O enrichment of biogenic aragonite relative to calcite at temperatures below 0 C. Isotopic values from the adult portion of the shell of *A. colbecki* were found to be reliable indicators of typical environmental conditions. These results demonstrate the potential usefulness of isotopic evidence from fossil *L. elliptica* and *A. colbecki* in reconstructing ancient antarctic seawater temperature/salinity and environments. (Auth. mod.)

E-51168

Gasperini, M., Alessandrini, B., Vigliotti, L., **Antarctic ice sheet: a possible trigger for the Gondwana break-up**, *Bollettino di geofisica teorica ed applicata*, June 1990, 32(126), p.157-164, 17 refs.

DLC QC801.B85 32

The non-uniform distribution of continental masses around the Earth's rotational axis generates a centrifugal pole-fleeing force: the Eötvös force or Polflüchtkraft. This force is at present too low to be one of the principal driving mechanisms of plate tectonic motion, but during the Paleozoic glaciation in the austral hemisphere it could have reached an intensity sufficient to drift Gondwanaland towards the equator. According to the "membrane theory", the stress due to lithospheric movement over a non-spherical Earth's asthenosphere was sufficient to start the Gondwanaland break-up 230 My ago and the onset of the circum-antarctic rift system. (Auth.)

E-51201

Krylov, D.P., Meshick, A.P., Shukoliukov, I.U. A., **Zircon Xe-Xe spectrum dating of primary events in high-grade metamorphic terrains—the example of Archean Napier Complex (East Antarctica)**, *Geochemical journal*, 1993, 27(2), p.91-102, 31 refs.

The Xe-Xe spectrum dating results are presented for zircons from early Archean Napier Complex (East Antarctica). Experimental procedure includes measurements of Xe isotope ratios during stepwise heating of samples after preliminary irradiation in a thermal column of a nuclear reactor. The most reliable Xe-Xe zircon ages of ca. 3.3-3.9 Ga are similar to the known dates of the crust formation in the region. In turn, the closure temperature estimates for the studied zircons mostly agree with the maximum conditions of the "primary" granulite metamorphism in the Napier Complex and exceed those for later processes. The correlation of the derived Xe-ages with granite metamorphism demonstrates that the oldest observed regional metamorphism shortly postdated the crust formation. Hence, the previously considered tremendous gap (0.5 b.y. or more) between the two events seems doubtful. (Auth. mod.)

E-51203

Hovan, S.A., ed, Janecek, T.R., ed, **Descriptions of sediment recovered by the R/V *Polar Duke*, cruise III, United States Antarctic Program 1988**, *Florida State University. Sedimentology Research Laboratory. Contribution*, Aug. 1994, No.59, 115p., Refs. p.109-115.

This is the second published volume in a series of sediment descriptions of material collected by the R/V *Polar Duke* in antarctic waters since 1985, obtained during the 1988 USAP cruise III (referred to as PD88-III). This cruise involved two scientific programs: an investigation of sedimentation in fjords of the Antarctic Peninsula region, and a seismic and coring survey of the continental shelf between 68W and 63W. The sediments recovered from these investigations are described

here to serve the general geologic community by providing descriptive information of sediments deposited around the continent of Antarctica and also to assist geoscientists wishing to pursue more detailed studies by serving as a guide for sediment sampling. Included are a summary of the scientific objectives of the PD88-III, a discussion of core recovery and processing, a table and map of station locations, an explanation of laboratory descriptive procedures, and lithologic descriptions of piston and gravity (trigger) cores, bagged samples, and grab samples.

E-51204

Hovan, S.A., ed, Janecek, T.R., ed, **Descriptions of sediment recovered by the R/V *Polar Duke*, cruise IV, United States Antarctic Program 1989**, *Florida State University. Sedimentology Research Laboratory. Contribution*, Aug. 1994, No.60, 43p., Refs. p.37-43.

This volume contains descriptions of sediments obtained by the R/V *Polar Duke*, cruise IV of 1989 (referred to as PD89-IV). The primary purpose of this cruise was to take heat flow measurements in the basins around the Antarctic Peninsula. A small number of piston cores were included to complement these studies and are described here to assist geoscientists as a guide for sediment sampling. Included are a discussion of core recovery and processing, a table and map of station locations, an explanation of laboratory descriptive procedures, and lithologic descriptions of piston and trigger cores collected during cruise PD89-IV.

E-51205

Hovan, S.A., ed, Janecek, T.R., ed, **Descriptions of sediment recovered by the R/V *Polar Duke*, cruises II and VII, United States Antarctic Program 1990**, *Florida State University. Sedimentology Research Laboratory. Contribution*, Aug. 1994, No.61, 84p., Refs. p.77-84.

This volume contains the descriptions of sediments recovered by the R/V *Polar Duke* during two cruises made in 1990 (PD90-II and PD90-VII). The cruise objective was to study the coastal and shelf regions of Antarctica. A number of marine geologic samples (piston cores, trigger cores, and grab samples) were collected and are described here to assist geoscientists as a guide for sediment sampling. Included are a summary of the scientific objectives of two cruises made by the R/V *Polar Duke* in 1990, a discussion of core recovery and processing, a table and map of station locations, an explanation of laboratory descriptive procedures, and lithologic descriptions of piston and trigger cores.

E-51206

Hovan, S.A., ed, Janecek, T.R., ed, **Descriptions of sediment recovered by the R/V *Polar Duke*, United States Antarctic Program 1991**, *Florida State University. Sedimentology Research Laboratory. Contribution*, Aug. 1994, No.62, 51p., Refs. p.44-51.

This volume contains the descriptions of sediments recovered by the R/V *Polar Duke* during the first cruise of 1991 (referred to as PD91). Much of this cruise was devoted to collecting approximately 2000 km of high-quality seismic records from the northwestern Weddell Sea and Antarctic Peninsula region. A small number of marine geologic samples (piston cores, trigger cores, gravity cores, and grab samples) were also collected and are described here to assist geoscientists as a guide for sediment sampling. Included are a summary of the scientific objectives of PD91, a discussion of core recovery and processing, a table and map of station locations, an explanation of laboratory descriptive procedures, and lithologic descriptions of piston, trigger, and gravity cores.

E-51207

Fitzgerald, P.G., **Thermochronologic constraints on post-Paleozoic tectonic evolution of the central Transantarctic Mountains, Antarctica**, *Tectonics*, Aug. 1994, 13(4), p.818-836, Refs. p.835-836.

Apatite fission track thermochronology on samples collected from the central Transantarctic Mountains (TAM) records a complex tectonic history for this region over the past 350 m.y. Apatite ages in the Miller Range vary from ca. 250 to 350 Ma and are from an exhumed apatite partial annealing zone formed following cooling of Cambro-Ordovician granitoids. A period of Cretaceous denudation (2 km), beginning at

115 Ma, is recorded at Moody Nunatak on the inland side of the TAM. Near the coast, samples along the Beardmore Glacier record rapid cooling indicative of denudation initiated in the early Cenozoic (50 Ma). The amount of uplift 70 km inland of the coast in the Queen Alexandra Range since the early Cenozoic is 7 km, with the likelihood of an additional 3 km at the coast. Eastward facing topographic escarpments in the Queen Alexandra Range mark the likely position of steeply dipping normal faults, which offset the apatite ages. Apatite ages on the east side of the Beardmore Glacier mouth are generally younger (average 27 Ma) than on the west side (average 33 Ma), reflecting greater denudation. Assumptions made regarding the use of an assumed paleogeothermal gradient are tested with available geologic evidence. (Auth. mod.)

E-51208

Richard, S.M., et al, **Cooling history of the northern Ford Ranges, Marie Byrd Land, West Antarctica**, *Tectonics*, Aug. 1994, 13(4), p.837-857, Refs. p.855-857.

The following sequence of events during the transition from convergence to extension along the Pacific margin of Gondwana is proposed: voluminous intrusion into the lower and middle crust led to increased heat flow and high-temperature, low- to moderate-pressure metamorphism, forming the Fosdick metamorphic complex (FMC) exposed in the Fosdick Mountains. Decrease in strength due to intrusion and partial melting resulted in large-scale flow, probably driven by extension-related differential stresses. This deformation ended before the onset of rapid cooling of the FMC at ca. 105 Ma. Cooling rates determined for the FMC can be modeled by decreasing the heat flux into the crust and exhuming the complex at a rate of 1.5 mm/yr. The decrease in cooling rate between closure of K-feldspar $^{40}\text{Ar}/^{39}\text{Ar}$ at 94 Ma and cooling into the apatite fission track partial annealing zone by 80 Ma is interpreted to indicate that exhumation was at least a two-stage process. Observations indicate that the Fosdick and Chester mountains are part of a coherent block that was tilted 20 deg to the south during the exhumation of the FMC, probably by movement along an east trending, north dipping, normal fault between the Fosdick and Phillips mountains. The Fosdick Mountains are not a Cordilleran-style metamorphic core complex, but the FMC provides a record of middle-crustal processes related to the rifting of New Zealand from Gondwana in the Late Cretaceous. (Auth. mod.)

E-51215

U.S. National Science Foundation, **United States Antarctic Program: R/V *Polar Duke* Cruise 90-7 report**, [Washington, D.C., 1991], 45p., 10 refs.

The objectives of the cruise were to obtain a complementary set of oceanographic and marine geologic data which would help to understand the depositional processes and resulting stratigraphy within antarctic fjords and corresponding offshore basins. Preliminary results are presented in numerous maps and charts. The discussion covers geophysics and oceanographic data, bottom sediments, and microfossil analysis.

E-51217

Torii, T., ed, **Japanese geochemical data in the McMurdo Dry Valleys and on Ross Island, Antarctica**, *Japanese Antarctic Research Expedition. JARE data reports*, Aug. 1994, No.199, 294p., 206 refs.

The Japanese geochemical studies in the McMurdo Dry Valleys region started in the 1963/1964 field season. Studies were mainly focused on the geochemical characteristics of lakes and ponds and their surroundings in Victoria, Wright, Taylor and Miers Valleys and also on Ross I. These extensive studies are providing many geochemical data, including general characteristics, major and trace elements, nutrients, organic matter, stable and radioisotope data and secondary minerals of lakes, ponds, and their surroundings. The studies were almost completed in the 1986-1987 summer season. The data of the Dry Valleys region and Ross I. are summarized and presented in tables.

E-51218

Hand, M., et al, **Geological observations in high-grade mid-Proterozoic rocks from Else Platform, northern Prince Charles Mountains region, East Antarctica**, *Australian journal of earth sciences*, Aug. 1994, 41(4), p.311-329, 54 refs.

Granulite facies rocks on Else Platform in the northern Prince Charles Mountains consist of metasedimentary gneiss extensively intruded by granitic rocks. The dominant rock type is a layered garnet-biotite-bearing gneiss intercalated with minor garnet-cordierite-sillimanite gneiss and calc-silicate. Voluminous megacrystic granite intruded early during a mid-Proterozoic (*ca.* 1000 Ma) granulite event, M_1 , widely recognized in East Antarctica. Peak metamorphic conditions for M_1 are in the range of 650-750 MPa at 800 °C and were associated with the development of a gneissic foliation, S_1 and steep east-plunging lineation, L_1 . Strain partitioning during progressive non-coaxial deformation formed large D_2 granulite facies south-dipping thrusts, with a steep, east-plunging lineation. In areas of lower D_2 high-strain, large-scale upright, steep east-plunging fold structures formed synchronously with the D_2 high-strain zones. Voluminous garnet-bearing leucogneiss intruded at 940 \pm 20 Ma and was deformed in the D_2 high-strain zones. Textural relationships in pelitic rocks show that peak M_2 assemblages formed during increasing temperatures via reactions such as biotite + sillimanite + quartz \pm plagioclase = spinel + cordierite + ilmenite + K-feldspar + melt. (Auth. mod.)

E-51227

Weaver, S.D., et al, **Antarctica-New Zealand rifting and Marie Byrd Land lithospheric magmatism linked to ridge subduction and mantle plume activity**, *Geology*, Sep. 1994, 22(9), p.811-814, 24 refs.

Mid-Cretaceous igneous rocks of central Marie Byrd Land record a rapid change from subduction-related to rift-related magmatism. This correlates with the final stages of subduction of the Phoenix plate and the subsequent rifting of New Zealand from West Antarctica, prior to the opening of the southern ocean. Rift magmatism produced diverse A-type granitoids and mafic intrusive rocks of continental flood-basalt affinity that were derived ultimately from lithospheric mantle sources. Rifting was caused by changes in plate boundary forces; however, mantle plume activity may have begun in mid-Cretaceous time, triggering melting of the lithosphere and controlling the locus of rifting. (Auth. mod.)

E-51250

Scorzelli, R.B., Galvão da Silva, E., Souza Azevedo, I., **Mössbauer study of thermal metamorphosed antarctic meteorites**, *Hyperfine interactions*, Feb. 1994, 83(1-4), p.473-477, 5 refs.

In this paper the authors report on variable temperature Mössbauer spectroscopy measurements on Yamato-82162 and Yamato-86720. These antarctic carbonaceous chondrites contrast with other non-antarctic carbonaceous chondrites in which no evidence of thermal metamorphism has been found. (Auth.)

E-51257

Italian Antarctic Research Programme, **Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports**, [Rome,], 1994, 80p., Refs. passim. For selected papers see E-51258 through E-51263, E-51266, E-51267, E-51269, E-51270, E-51275, E-51277, F-51271 through F-51274, F-51276, L-51264, L-51265, L-51268, L-51278, and L-51279, or 49-602 through 49-609.

This is the first publication of collected data reports of field activities carried out during the 9th Italian Antarctic Expedition in 1993-1994. The research was carried out mostly in northern Victoria Land; the brief reports are grouped as follows: structure and evolution of the lithosphere in the Ross Sea area; periantarctic basins and antarctic plate margins; glaciology and paleoclimate; and geophysical observatories.

E-51258

Colombo, F., Talarico, F., **Geological investigations in the Campbell Glacier High Grade Metamorphic Complex (northern Victoria Land, Antarctica)**, Italian Antarctic Research Programme. *Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports*, [Rome, 1994], p.7-8, 3 refs.

The geological work reported here was performed during the 1993-94 Italian expedition to the west side of Campbell Glacier, focusing on the High Grade Metamorphic Complex and including the granulite belt

of Castelli et al. (1991). Detailed field work was performed on both granulite and migmatite rocks of the area, from Granulite Knob through Mills Peak and Mount Queensland to Mount Dickason and the upper part of Boomerang Glacier.

E-51259

Carosi, R., et al, **Structural and metamorphic geology of the southern Wilson Terrane (northern Victoria Land, Antarctica)**, Italian Antarctic Research Programme. *Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports*, [Rome, 1994], p.9-11.

The aim of the field work reported here was to improve the study of metamorphic and intrusive rocks of the Wilson Terrane in the Deep Freeze Range and Prince Albert Mountains. In these areas, the Wilson Terrane is made up of metamorphic rocks ranging from low grade (Priestley Formation) to medium and high grade (Priestley Schist), and by intrusive rocks belonging to the Cambrian-Ordovician Granite Harbor Intrusives (GHI). The latter have compositions from diorite to leucogranite with meta- and peraluminous affinity.

E-51260

Di Vincenzo, G., Fioretti, A.M., Rocchi, S., **Investigation on Cambro-Ordovician granitoids of the Wilson Terrane, northern Victoria Land, Antarctica**, Italian Antarctic Research Programme. *Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports*, [Rome, 1994], p.12-15, 4 refs.

During the Cambro-Ordovician Ross Orogeny, the Wilson Terrane was the site of an important magmatic activity whose intrusive products are comprehensively known as Granite Harbor Intrusives (GHI). This widespread magmatic association is highly variable in both composition and structural history. These variably sized plutons were emplaced over a probably long time span (>50? Ma), both during the metamorphic phase(s) and after the metamorphic climax. GHI is a calcalkaline association with a variable K enrichment emplaced in an orogenic tectonic environment. During the austral summer of 1993-94, the fieldwork objectives were to complete the previous sampling, to visit new outcrops, and to improve field observations in some crucial areas. Field studies were concentrated in four main areas: Northern Foothills, Inexpressible I. and Vegetation I.; Mountaineer Range and lower Tinker Glacier; central-southern Deep Freeze Range; and the area between Reeves Glacier and Tripp I.

E-51261

Capponi, G., et al, **Geological transect through the Wilson-Bowers-Robertson Bay Terranes junction (northern Victoria Land, Antarctica)**, Italian Antarctic Research Programme. *Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports*, [Rome, 1994], p.16-19.

The report discusses briefly the geologic evolution of the Bowers and Robertson Bay Terranes, the geologic evolution of the Wilson Terrane, and the tectonic junction between the two regions.

E-51262

Fioretti, A.M., **Admiralty Intrusives in the Mariner Glacier-Tucker Glacier area, northern Victoria Land, Antarctica**, Italian Antarctic Research Programme. *Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports*, [Rome, 1994], p.20-21, 1 ref.

The Admiralty Intrusives (AI) represent an important magmatic event of Devonian age (*ca.* 390-360 Ma) that follows the accretion of the three geological terranes which make up northern Victoria Land. The AI crops out both in the Bowers Terrane and in the Robertson Bay Terrane and intrudes also the contact between the Bowers Terrane and the Wilson Terrane. The field evidence sets up an upper chronological limit to the accretion of the three terranes. In 1993-94, the aim of the investigation was to acquire more field data and samples on some other plutons belonging to the same magmatic cycle and to the coeval volcanics in order to obtain an updated global picture of the Devonian magmatism in the selected area of Mariner-Tucker glaciers.

E-51263

Della Vedova, B., et al, **ACRUP-1 Experiment Part 1: Deep crustal investigations across the Transantarctic Mountains and the adjacent Ross Sea Depression. Part 2: Deep crustal investigations across the southern Ross Sea**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.22-25.

ACRUP-1 (Antarctic CRUstal Profile 1) is a multidisciplinary research project in the Ross Sea area, supported by the Italian PNRA (Programma Nazionale di Ricerche in Antartide) in cooperation with a number of research institutions and universities in Italy, Germany and the U.S., to study the crustal and subcrustal structures at the transition between the Transantarctic Mountains (TAM) and the Ross Sea Depression (RSD). The former borders the old east antarctic craton and is affected by uplift and block faulting, whereas the latter is floored by an attenuated continental crust which experienced Cenozoic rifting, subsidence and volcanic processes. A sharp lithospheric transition is expected between the two distinct domains. The project was planned and defined among the proponents in 1992-93 and was carried out during the austral summer 1993-94 within the IX Italian Antarctic Expedition. The research activities included both onshore and offshore seismic experiments, integrated by geological and geophysical investigations. A figure shows the position of the planned ACRUP-1 profiles and the experiments carried out during the 1993-94 field season.

E-51266

Balestrieri, M.L., **Time and rates of the uplift of the Transantarctic Mountains**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.35-38, 4 refs.

The aims of the sampling for the Apatite Fission Track Analysis (AFTA) during the 1993-94 expedition were to collect samples along vertical profiles to identify uplift-denudation phases in various sectors of the region between Mariner and David Glaciers, and to investigate the possible influence of the thermal effect of the Cenozoic Intrusives, widespread in the coastal area, on the uplift-denudation history reconstructed by AFTA. Four vertical profiles and two horizontal sections were taken into account. All samples come from the Granite Harbour Intrusives Complex, except two samples which come from the Mt. Monteaule Cenozoic Intrusion.

E-51267

Armienti, P., Pompilio, M., Rocchi, S., **Cenozoic magmatism between Campbell and Icebreaker Glaciers, northern Victoria Land, Antarctica**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.39-41, 6 refs.

During the 9th Italian Antarctic Expedition in northern Victoria Land, five areas were investigated and sampled in order to fill the geologic and chronological gaps existing in the Cenozoic record of igneous activity that accompanied the uplift of the Transantarctic Mountains. Daniell Peninsula, Vulcan Hills, Mountaineer Range, Tinker Glacier and the coastal area between the Starr Nunatak and Campbell Glacier are the areas in which the field work was carried out, reaching the goal to fill some temporal gaps existing in the magmatic sequences in the area between Oligocene and Middle Miocene.

E-51269

Capponi, G., Meccheri, M., **Geological mapping in the Mt. Joyce area, Victoria Land, Antarctica**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.44-45, 2 refs.

During the 9th ItaliAntartide Expedition (1993-94) geological mapping was carried out in the area of Mount Joyce and Relief Inlet, at 1:250,000 scale. Outcrops nearest to the coast (Mount George Murray, Mount Stephen) consist of Granite Harbor Intrusives, often with dikes of McMurdo volcanic rocks. The outcrops of the central area (from Mount Howard to Richards Nunatak) mainly consist of dolerites, with a very typical columnar fracturing; thin and non-continuous horizons of Beacon sandstone are also present. The outcrops of the western part of the investigated area (Brimstone Peak, Outpost Nunataks and McLea Nuna-

tak) show the presence of basalts and volcano-sedimentary rocks (Kirkpatrick Basalts); the southern side of Brimstone Peak and the northern side of Outpost Nunataks show fine examples of such rocks with spectacular pillow lavas.

E-51270

Peyve, A., et al, **Cruise report Strakhov-18, Bouvet Triple Junction, February-May 1994**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.46-53, 8 refs.

The main goal of this project was to delineate the structural, compositional and morphological differences between the "cold" ridge segment of the South America/Africa Plates at the north branch of the Bouvet Triple Junction and the "hot" ridge segment east of Bouvet I. Additionally, the data of the ridge segment of SA/AF Plates at Bouvet Triple Junction will provide useful information on the evolution of the junction in the last 2 m.y. To accomplish this result the authors carried out multibeam, gravity, magnetic, multi and single channel seismic reflection investigation as well as sampling of the sea bottom in two selected areas east of Bouvet I. and north of Bouvet Triple Junction.

E-51275

Folco, L., Franchi, I.A., Fioretti, A.M., Meneghel, M., **EUROMET/PNRA meteorite collection expedition to Frontier Mountain northern Victoria Land, Antarctica**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.63-66, 5 refs.

There were three objectives for the 1993-94 EUROMET/PNRA meteorite collection expedition to Frontier Mountain (FM): to complete the collection of meteorites in the known productive sites and extend systematic searches into unexplored areas at FM; to initiate a thorough study of the meteorite concentration mechanism operative at FM; and to reconnoitre other productive areas in the nearby blue ice fields of the Outback Nunataks region. The project was carried out within the framework of the IX PNRA Antarctic Expedition, as part of the Glaciology and Paleoclimatology Program.

E-51277

Anderson, J.B., Taviani, M., Trincardi, F., **Cruise NBP94-01 in the Ross Sea**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.70.

The R/V *Nathaniel B. Palmer* left McMurdo on Feb. 20, 1994 for a three-week geological cruise in the Ross Sea. The primary objective of the cruise was to obtain marine geological data on the behavior of the West Antarctic Ice Sheet since the end of the last glaciation and, in particular, to test the hypothesis of its rapid collapse in response to sea level rise. The cruise is the first leg devoted to this scientific purpose. The second leg will take place aboard the R/V *Nathaniel B. Palmer* in summer 1995.

E-51283

Treiman, A.H., et al, **Comparison of the LEW88516 and ALH77005 martian meteorites: similar but distinct**, *Meteoritics*, Sep. 1994, 29(5), p.581-592, 46 refs.

By mineral and bulk compositions, the Lewis Cliff (LEW) 88516 meteorite is quite similar to the ALH77005 martian meteorite. These two meteorites are not paired because their mineral compositions are distinct; they were found 500 km apart in ice fields with different sources for meteorites, and their terrestrial residence ages are different. Mineral contents identified, textures observed, and chemical analyses of the samples are compared and discussed. Key element abundance ratios, including those of noble gases, are noted, and cosmic ray exposure dates are deduced. The absence of substantial effects of shielding from cosmic rays suggests that LEW88516 was an object no larger than a few cm in diameter. (Auth. mod.)

E-51284

Krähenbühl, U., Langenauer, M., **ALH82102: an antarctic meteorite embedded partly in ice**, *Meteoritics*, Sep. 1994,

29(5), p.651-653, 12 refs.

The concentration of F, Cl, Br and I were measured in two different aliquots of the meteorite ALH 82102. This H5 chondrite was recovered at the Allan Hills region where it was partially embedded in the ice. One aliquot was taken from that part of the surface of the meteorite that was still in the ice, and the other one was taken from the exposed part. Both aliquots are highly, and nearly to the same degree, contaminated with halogens. The observed enrichments occurred mainly during the time the meteorite was lying on the surface of the ice by deposition and/or adsorption of aerosols, salts, and gaseous components. Contamination during the time it was covered by the ice is unlikely. It is concluded, therefore, that this meteorite was not always buried in the ice during its "residence time" on Earth. In order to accumulate the observed contamination, it had to be on the surface of the ice part of the time between its fall onto the Earth and its collection. The age of the ice surrounding the meteorite cannot be equal to the measured terrestrial age of ALH 82102. (Auth.)

E-51285

Krot, A.N., Rubin, A.E., **Glass-rich chondrules in ordinary chondrites**, *Meteoritics*, Sep. 1994, 29(5), p.697-707, 42 refs.

There are two types of glass-rich chondrules in unequilibrated ordinary chondrites (OC): porphyritic chondrules containing 55-85 vol% glass or microcrystalline mesostasis and nonporphyritic chondrules, containing 90-99 vol% glass. These two types are similar in mineralogy and bulk composition to previously described Al-rich chondrules in OC. In addition to Si-, Al- and Na-rich glass or Ca-Al-rich microcrystalline mesostasis, glass-rich chondrules contain dendritic and skeletal crystals of olivine, Al_2O_3 -rich low-Ca pyroxene and fassaite. Some chondrules contain relict grains of forsterite +/- Mg-Al spinel. It is suggested that glass-rich chondrules were formed early in nebular history by melting fine-grained precursor materials rich in refractory (Ca, Al, Ti) and moderately volatile (Na, K) components (possibly related to Ca-Al-rich inclusions) admixed with coarse relict forsterite and spinel grains derived from previously disrupted type-I chondrules. Chondrule fragments from meteorites gathered from Allan Hills and Lewis Cliff were used as chemical and mineral sources for the analyses resulting from this study. (Auth. mod.)

E-51286

Krot, A.N., Wasson, J.T., **Silica-merrihueite/roedderite-bearing chondrules and clasts in ordinary chondrites: new occurrences and possible origin**, *Meteoritics*, Sep. 1994, 29(5), p.707-718, 56 refs.

Merrihueite is a rare mineral described only in several chondrules and irregularly-shaped fragments in the Mezö-Madaras L3 chondrite. Roedderite has been found only in enstatite chondrites and in the reduced, subchondritic silicate inclusions in IAB irons. Described here are silica-roedderite-bearing clasts in L/LL3.5 ALHA77011 and LL3.7 ALHA77278, a silica-roedderite-bearing chondrule in L3 Mezö-Madaras, and a silica-merrihueite-bearing chondrule in L/LL3.5 ALHA77115. The findings of merrihueite and roedderite in ALHA77011, ALHA77115, ALHA77278 and Mezö-Madaras fill the compositional gap between previously described roedderite in enstatite chondrites and silicate inclusions in IAB irons and merrihueite in Mezö-Madaras, suggesting that there is a complete solid solution of roedderite and merrihueite in meteorites. It is inferred that the silica- and merrihueite/roedderite-bearing chondrules and clasts experienced a complex formational history comprising at least five identifiable stages of development, which are examined. (Auth. mod.)

E-51297

Crame, J.A., **Bipolar molluscs and their evolutionary implications**, *Journal of biogeography*, Mar. 1993, 20(2), p.145-161, Refs. p.157-161.

The phenomenon of bipolarity, one of the major disjunct distribution patterns, has been investigated repeatedly since the mid-nineteenth century. Running through the many hypotheses that have been put forward to account for its occurrence, it is possible to detect two persistent themes: it is usually interpreted within a dispersal framework, and it is generally believed to be of comparatively recent origin. Current palaeontological investigations have established that bipolarity can now be traced back to at least the Early Jurassic period. In the Late Jurassic inoc-

eramid, buchiid and oxytomid bivalve occurrences at Northern Hemisphere localities such as arctic Canada, N.W. Europe, Siberia, N.E. USSR and Japan can be matched with those in southern South America, Antarctica and Australasia. There is strong circumstantial evidence to suggest that bipolar molluscs continued to develop through the Cenozoic era. It is possible to set the Jurassic and Cretaceous examples of bipolarity within a largely vicariant framework based upon the disintegration of the Pangean supercontinent. Similarly, it is possible to view late Paleogene-early Neogene bipolarity as a vicariant event, but this time with climatic change identified as the single most important agent. Widespread or cosmopolitan distributions are held to have formed during global cool phases (such as the late Eocene-early Miocene) only to be disrupted by global warming (such as in the late Early Miocene). It is even possible to view Plio-Pleistocene patterns as, at least in part, the products of vicariant events caused by rapid temperature and sea level shifts. (Auth. mod.)

E-51298

Crame, J.A., Pirrie, D., Crampton, J.S., Duane, A.M., **Stratigraphy and regional significance of the Upper Jurassic-Lower Cretaceous Byers Group, Livingston Island, Antarctica**, *Journal of the Geological Society, London*, Nov. 1993, 150(Part 6), p.1075-1087, 39 refs.

Byers Peninsula comprises a mudstone dominated sequence at least 1 km thick which accumulated in a marginal fore-arc environment. The basal 105 m thick Anchorage Formation consists of radiolarian mudstones and tuff-rich interbeds of Kimmeridgian-Tithonian age; it correlates with Upper Jurassic organic-rich mudstone units throughout the proto-South Atlantic region. The succeeding 244 m thick Devils Point Formation marks the first major pulse of coarse volcanoclastic material into the basin. It is in turn followed by the extensive President Beaches Formation, comprising several hundred meters of finely laminated mudstones with at least two major sandstone intercalations. Molluscan and dinoflagellate cyst taxa indicate a Berriasian age and comparatively nearshore depositional environment for this unit. An unconformity of late Berriasian or early Valanginian age separates the three lowest formations from the Chester Cone Formation. The fine-grained Sealer Hill Member at the base of the latter is dated as Valanginian, and grades up into several hundred meters of pebbly sandstones and pebble-granule conglomerates. These mark the second major volcanoclastic pulse and may be of Hauterivian or even younger age. Definition of this major new group will facilitate more precise Upper Jurassic-Lower Cretaceous stratigraphical correlations within the southern South America-Scotia arc-Antarctic Peninsula region. (Auth. mod.)

E-51299

Moyes, A.B., Barton, J.M., Jr., Groenewald, P.B., **Late Proterozoic to Early Palaeozoic tectonism in Dronning Maud Land, Antarctica: supercontinental fragmentation and amalgamation**, *Journal of the Geological Society, London*, Sep. 1993, 150(Part 5), p.833-842, 38 refs.

Recent proposals suggest geological continuity between Laurentia and Gondwana during the Middle Proterozoic (the SWEAT hypothesis). Gondwana amalgamation from the remaining constituents followed fragmentation and rifting of Laurentia from this supercontinent, culminating in a Late Cambrian orogeny at c. 500 Ma. The Mid-Proterozoic-Early Palaeozoic tectonic development of western Dronning Maud Land was significantly different to that observed in the Transantarctic Mountains, and the c. 500 Ma event in particular is characterized by: (1) a regional isotopic resetting event at c. 470 Ma, (2) scarce coeval magmatism, comprising only one major intrusion of alkaline affinity, and volumetrically small 'S-type' granitic sheets derived from local anatexis of gneisses, (3) structural deformation considerably less intense than during the preceding Kibaran (1100 Ma) orogeny, comprising relatively open to gentle folding, (4) reactivation of thrusting initiated during the Kibaran orogeny, with associated metasomatism. It is concluded that the effects of the Late Cambrian (c. 500 Ma) event are consistent with crustal thickening through large-scale underplating, rather than subduction-related processes as seen in the Ross orogeny of the Transantarctic Mountains. It is also concluded that Gondwana amalgamation occurred along suture lines not currently exposed in outcrop in Dronning Maud Land. These data neither contradict nor support the SWEAT hypothesis as currently argued. (Auth.)

E-51303

Petrova, V.I., Daniushevskaya, A.I., **Geochemical characteristics of the organic matter in the bottom sediment of the Weddell Sea** [Geokhimicheskie osobennosti organicheskogo veshchestva donnykh otlozhenii moria Ueddella], Modelirovanie neftegazobrazovaniia; sbornik nauchnykh trudov (Modeling oil and gas formation; collected scientific papers). Edited by S.G. Neruchev, O.K. Bazhenova and N.V. Marasanova, Moscow, Nauka, 1992, p.181-185, In Russian. 10 refs.

Obtained data appear to show that the content and individual composition of polycyclic areas in sediments of the Weddell Sea are due chiefly to the genesis of organic matter and only in isolated cases to secondary processes. The results reflect the information content of the geochemical investigations of the polycyclic areas during the monitoring of bottom sediments. Differences, revealed during the correlation of the distribution of polycyclic areas in sediments of the southern and northern polar zones of the world ocean, confirm that revealing the geochemical background during the analysis of the ecological condition of the waters is indispensable. It is also important for the genetic diagnosis of hydrocarbon anomalies. (Auth. mod.)

E-51305

Hayes, D.E., Kane, K.A., **Long-lived mid-ocean ridge segmentation of the Pacific-Antarctic ridge and the Southeast Indian ridge**, *Journal of geophysical research*, Oct. 10, 1994, 99(B10), p.19,679-19,692, 43 refs.

The Pacific-Antarctic and the Southeast Indian ridge are examined for evidence of long-lived (tens of millions of years) tectonic segmentation of the mid-ocean ridge by examining a variety of geophysical parameters similar to those previously documented in the South Atlantic. These parameters include subsidence rate of the oceanic crust (individual flanks and asymmetry), zero-age depth, and geoid height decrease with age (geoid rate). The variability in these parameters along-strike of the mid-ocean ridge is systematic and serves to define a large scale ridge segmentation of the order of hundreds of kilometers. The Southeast Indian ridge exhibits long-lived segmentation in all parameters examined and is subdivided into five flow line corridors with boundaries between corridors occurring at or near major fracture zones. While the Pacific-Antarctic ridge exhibits conspicuous asymmetric crustal subsidence, evidence of segmentation exists primarily in the along-strike geoid rate. The observations in these two areas are found to be internally inconsistent with simple thermal conduction models for oceanic crust, strongly suggesting that factors other than cooling and isostasy are influencing the creation and subsequent modification of the oceanic crust and lithosphere. (Auth. mod.)

E-51307

Shinonaga, T., et al, **Weathering of antarctic meteorites investigated from contents of Fe³⁺, chlorine, and iodine**, *Geochimica et cosmochimica acta*, Sep. 1994, 58(17), p.3735-3740, 25 refs.

The chemical states of iron in fourteen antarctic H chondrites were studied by means of Mössbauer spectroscopy. Fe³⁺, Fe²⁺, troilite, and Fe-Ni alloy were analyzed in all meteorites. Determinations of Cl and I in 28 antarctic H, L, and LL chondrites were carried out by radiochemical neutron activation analysis, and those in three antarctic eucrites were carried out by isotope dilution mass spectrometry. The results ranged from 90 to 1700 ppm for Cl and from 0.07 to 5 ppm for I in ordinary chondrites, and from 30 to 330 ppm for Cl and from 1 to 9 ppm for I in eucrites. On the basis of the data on halogens and the Mössbauer spectroscopy, terrestrial weathering of antarctic meteorites are discussed. The relative amount of Fe³⁺ in H chondrites correlates positively with chlorine and iodine contents, and Fe²⁺ and troilite correlate negatively. Chlorine shows a higher enrichment in ordinary chondrites than in eucrites whereas the I enrichment seems to be larger in Fe-Ni alloy-poor meteorites. (Auth.)

E-51314

Willan, R.C.R., **Structural setting and timing of hydrothermal veins and breccias on Hurd Peninsula, South Shetland Islands: a possible volcanic-related epithermal system in deformed turbidites**, *Geological magazine*, July 1994, 131(4),

p.465-483, 57 refs.

The main vein and breccia swarm trends for 14 km NNE along-strike and 2 km across-strike, cutting large irregular areas of silicified and brecciated sandstone, and patchy areas of pyritic, propylitic and K-feldspar alteration. Angular vein fabrics and hydraulic disruption textures indicate wedging by hydrothermal solutions, hydraulic rupture, brecciation and fragment transport, followed by open-space precipitation, in veins generally <15 cm thick and breccias up to a few meters thick. Hydrothermal quartz, chlorite, calcite and chalcedony predominate, with variable amounts of chalcopryite, galena, sphalerite and pyrite. Epidote, arsenopyrite, K-feldspar and andradite garnet are conspicuous in places. Breccias were pre- and syn-mineralization, whereas mineral precipitation was pre-, syn- and post-breccia formation. Hydrothermal activity was simultaneous with extensional faulting, striking NNE, and accompanied by intrusion of dacitic dykes. There followed conjugate shearing on east- and ESE-striking faults, intrusion of high-level tonalite stocks, and several phases of basaltic andesite dyke intrusion. These hypabyssal rocks were probably coeval with the Antarctic Peninsula Volcanic Group dominating Livingston I., dated between 130 and 75 Ma. Minor copper and iron sulphide-bearing veins occur in adjacent volcanic and hypabyssal intrusive rocks. The Hurd Peninsula veins may therefore form part of a volcanic-epithermal hydrothermal system (adularia-sericite-quartz type), of Cretaceous age, rather than a porphyry-related system of Eocene age. (Auth. mod.)

E-51324

Pirrie, D., Ditchfield, P.W., Marshall, J.D., **Burial diagenesis and pore-fluid evolution in a Mesozoic back-arc basin: the Marambio Group, Vega Island, Antarctica**, *Journal of sedimentary research*, July 1, 1994, A64(3), p.541-552, 39 refs.

Upper Cretaceous shallow-marine sediments from Vega I. contain 5 major authigenic phases: glauconite, pyrite, a zeolite mineral of the clinoptilolite-heulandite group, chlorite, and calcite. The framework sediment composition changes from quartzose at the base of the measured succession to volcanoclastic at the top. The petrogenesis of individual samples reflects the local controls on diagenesis of depositional environment and sediment composition, combined with the effects of burial to no more than 1 km. The stable-isotope composition of the carbonate cements is quite variable and reflects the initial conditions of mineral precipitation in oxic and anoxic marine pore waters, together with the effects of subsequent fluid/rock interaction through both recrystallization and cementation. The latest precipitates define a vertical field for burial calcite on an isotope cross plot, suggesting that late fluids responsible for cementation and alteration of earlier precipitates had negative $\delta^{18}\text{O}$ and contained carbon with variable $\delta^{13}\text{C}$. The oxygen values are compatible with either influx of high-latitude meteoric water or intense fluid-rock interaction with reactive volcanic detritus, or a combination of the two processes. Only by identifying possible end-member compositions for both early and late diagenetic precipitates can most of the isotopic data be interpreted correctly. (Auth. mod.)

E-51325

Barbu, E.M., ed, **Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau**, College Station, TX, Texas A and M University, 1992, p.451-1155., Refs. passim. For individual papers see E-51326 through E-51365.

DLC QE39.T49b

This volume presents results from the Ocean Drilling Program (ODP), where scientists use a specially equipped ocean drilling ship to sample and measure the properties of the submerged part of the Earth's crust. Forty papers are presented, grouped into the following sections: paleontology, biostratigraphy, and paleoenvironment of Cenozoic rocks; geophysical studies; syntheses; data reports; and appendixes.

E-51326

Ehrendorfer, T., Aubry, M.P., **Calcareous nannoplankton changes across the Cretaceous/Paleocene boundary in the southern Indian Ocean (Site 750)**, *Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau*, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.451-470, 24 refs.

DLC QE39.T49b

Changes in the composition of calcareous nannoplankton across the Cretaceous/Paleocene boundary at southern high-latitude Ocean Drilling Program Hole 750A are documented in this semiquantitative study. These changes are compared with changes described from other localities at high and low latitudes. This study provides additional data toward a detailed documentation of the paleontologic changes that occurred in the late Maestrichtian and the early Paleocene, despite limitations to the interpretation caused by coring gaps, drilling disturbance, and the presence of an unconformity at the boundary at this site. (Auth.)

E-51327

Aubry, M.P., **Paleogene calcareous nannofossils from the Kerguelen Plateau, Leg 120**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.471-491, 20 refs.

DLC QE39.T49b

Calcareous nannofossils are abundant in the Paleogene sediments recovered during ODP Leg 120. Although no continuous Paleogene section was obtained, Sites 747 through 751 complemented each other so as to provide a virtually complete composite stratigraphic section. The calcareous nannofossil biostratigraphy at Sites 747, 748, and 749 is discussed. Correlation of calcareous nannofossil biozones and magnetostratigraphic zones at these sites suggests some diachrony with low-latitude areas, as well as on a regional basis. Changes in calcareous nannofossil diversity throughout the Paleogene are analyzed and interpreted as reflecting major paleoclimatic events. (Auth.)

E-51328

Firth, J.V., Wise, S.W., Jr., **Preliminary study of the evolution of *Chiasmolithus* in the middle Eocene to Oligocene of Sites 647 and 748**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.493-508, 22 refs.

DLC QE39.T49b

In this preliminary biometric study of the calcareous nannofossil species *Chiasmolithus expansus*, *C. oamaruensis*, and *C. altus* from the Upper Middle Eocene to Lower Oligocene of Sites 647 and 748, the authors document a complete gradation of forms among all 3 species. *C. oamaruensis* has significantly higher morphologic variance than the other species. The *Chiasmolithus* population at each site changes from *C. expansus* to *C. oamaruensis* and then to *C. altus*. This may not reflect a true evolutionary sequence because a major reversal in shape change of the central cross-bar structure accompanies this sequence, and because *C. altus* is morphologically closer to *C. expansus* than it is to *C. oamaruensis*. Reported stratigraphic and paleogeographic occurrences of *C. oamaruensis* and *C. altus* show different latitudinal distributions. These morphological and distributional patterns may be explained by a continuous morphologic gradient between *C. oamaruensis* and *C. altus*, with *C. oamaruensis* occurring more commonly in cool-water paleoenvironments, and *C. altus* occurring more commonly in cold-water paleoenvironments. Thus, paleoenvironmental fluctuations at Site 748 may be the cause of the morphologic fluctuations in *Chiasmolithus*. This hypothesis can be tested against previously proposed evolutionary models by more detailed sampling of sections along a latitudinal transect. (Auth. mod.)

E-51329

Wei, W., Wise, S.W., Jr., **Oligocene-Pleistocene calcareous nannofossils from southern ocean Sites 747, 748, and 751**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.509-521, Refs. p.516-517.

DLC QE39.T49b

Detailed calcareous nannofossil range charts for the Oligocene-Pleistocene sections from high-latitude ODP Sites 747, 748, and 751 in the southern Indian Ocean are presented in this report. Calcareous nannofossils are generally low in abundance in Pliocene-Pleistocene sediments, whereas they are very abundant throughout the Miocene and Oligocene. Species diversity, however, is low compared with assem-

blages in the lower latitudes. Nannofossil reworking is extensive in the Middle Miocene at Site 751, less extensive in the Lower Miocene at Site 748, and negligible for the entire Neogene at Site 747. Six nannofossil datums, which have previously been correlated with magnetostratigraphy in the southern ocean, were recognized in the Upper Oligocene-Pleistocene sequence at Site 747. Three such nannofossil datums are available for the Neogene at Sites 748 and 751. A new subspecies, *Coccolithus pelagicus floralis*, is described. (Auth.)

E-51330

Wei, W., Wise, S.W., Jr., **Selected Neogene calcareous nannofossil index taxa of the southern ocean: biochronology, biometrics, and paleoceanography**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.523-537, Refs. p.534-535.

DLC QE39.T49b

Data presented here reveal that the first occurrence (FO) of *Calcidiscus leptoporus/Calcidiscus macintyreii* is not a useful event on Maud Rise, but is an excellent biostratigraphic marker on the Kerguelen Plateau with an age of about 18.1 Ma. The last occurrence (LO) of *Cyclicargolithus floridanus* is also a useful datum (11.1-12.2 Ma) in the southern high latitudes. The FO of *Reticulofenestra perplexa* is consistently younger toward the lower latitudes and the age vs. latitude curve established can be used to estimate the age of this datum in different latitudes of the southern ocean. A biometric study of *R. perplexa* for Sites 744 and 748 on the Kerguelen Plateau shows that most specimens range from 5 to 8 microns in length. Abundance changes of *R. perplexa* relative to *Coccolithus pelagicus* have been studied in six ODP sites in the southern ocean. The patterns of abundance changes are generally similar at these southern high-latitude sites, and the abundance fluctuations in the 10-8 Ma interval can be interpreted as reflections of alternating warm and cool events during that time interval. Because of its ability to tolerate and even thrive in cold surface waters, *R. perplexa* significantly influenced the carbonate-compensation depth (CCD) in the southern ocean during the Miocene. The disappearance of this species coupled with the establishment of the Polar Front Zone during the Late Miocene-Early Pliocene glaciations of East and West Antarctica left the high-latitude southern ocean virtually devoid of nannofossil ooze deposition. (Auth. mod.)

E-51331

Beaufort, L., Aubry, M.P., **Paleoceanographic implications of a 17-m.y.-long record of high-latitude Miocene calcareous nannoplankton fluctuations**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.539-549, Refs. p.545-546.

DLC QE39.T49b

A record based on counts of the relative abundance of the dominant calcareous nannofossil taxa *Coccolithus pelagicus* and *Reticulofenestra* spp. in sediments recovered from ODP Hole 747A is established in this paper. This record (17 m.y. long) virtually spans the entire Miocene. Broad, step-like variations in the abundance of *C. pelagicus* range between 0 and 96%. Based on these variations, 5 stratigraphic units characterized by high abundance in *C. pelagicus* are delineated. The authors suggest that these variations are caused by water-mass movements (such as the north/south shifting of a front). This pronounced signal is compared with paleoceanographic events revealed by isotopic ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$) studies. The 5 defined units are tentatively correlated to well-known global isotopic events. In particular, Units A and D correlate respectively with the Oligocene/Miocene boundary glaciation and the middle Miocene cooling event. Time-series analysis indicates the presence of the 3 main periodic components of the eccentricity of the Earth's orbit. A 200-k.y. cycle is also present. The stratigraphic and paleoceanographic significance of this record is discussed. (Auth.)

E-51332

Berggren, W.A., **Paleogene planktonic foraminifer magneto-biostratigraphy of the southern Kerguelen Plateau (Sites 747-749)**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by

E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.551-568, 20 refs.

DLC QE39.T49b

An essentially complete Paleogene record was recovered on the central and southern Kerguelen plateaus in a calcareous biofacies. Recovery deteriorated in the Middle Eocene and down to the Upper Paleocene because of the presence of interbedded cherts and chalks. The stratigraphic distribution of about 70 taxa of planktonic foraminifers recovered at Sites 747-749 is reported in this paper. Faunas exhibited fairly high diversity (approximately 20-25 species) in the Early Eocene, followed by a gradual reduction in diversity in the Middle Eocene. A brief incursion of tropical keeled morozovellids occurred near the Paleocene/Eocene boundary, similar to that recorded on the Maud Rise (ODP Sites 689 and 690). The high-latitude Paleogene zonal scheme developed for ODP Leg 113 sites has been adopted (with minor modifications) for the Lower Eocene-Oligocene part of the Kerguelen Plateau record. A representative Oligocene (polarity chronozones 7-13) and Late Eocene-Late Middle Eocene (questionably polarity chronozones 16-18) magnetostratigraphic record has allowed the calibration of several biostratigraphic datum levels to the standard Global Polarity Time Scale (GPTS) and established their essential synchrony between low and high latitudes. (Auth.)

E-51333

Li, Q., Radford, S.S., Banner, F.T., **Distribution of microperforate tenuitellid planktonic foraminifers in Holes 747A and 749B, Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.569-594, Refs. p.587-588.

DLC QE39.T49b

Late Eocene to Pleistocene planktonic foraminifers from Leg 120 Holes 747A and 749B on the Kerguelen Plateau were quantitatively analyzed. Microperforate tenuitellid forms dominate the Oligocene to Middle Miocene, and 17 species (including the new species *Tenuitella jamesi* and *Tenuitellina selleyi*) are recorded. A lineage zonation of tenuitellid foraminifers is proposed as an alternative scheme for refinement of the Oligocene-Miocene biostratigraphy in high latitudes. Progressive or abrupt alterations in morphological characters within this lineage, producing different morphotypes or species, coincided with prolonged or sudden changes in paleoclimate. These microperforate planktonic foraminifers thus appear to have potential as indicators of cold-water masses and temperature fluctuations in post-Eocene oceans. (Auth.)

E-51334

Li, Q., Radford, S.S., **Morphology and affinity of the planktonic foraminifer *Cassigerinelloita amekiensis* Stolk and reclassification of *Cassigerinelloita* Stolk**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.595-602, Refs. p.599-600.

DLC QE39.T49b

Cassigerinelloita amekiensis Stolk occurs abundantly in lower middle Eocene samples from the southern Kerguelen Plateau, drilled during ODP Leg 120 (Hole 749B). It showed little morphological change during its rather short evolutionary history. Because of its microperforate, pustulate wall and a triserial, pseudoplanispiral coiling mode, *C. amekiensis* appears to be related closely to co-occurring *Guembelitra triseriata* (Terquem). These affinities indicate that the taxa are phylogenetically related and should be classified together in the family Guembelitriidae. The potential paleoceanographic importance of these forms is also discussed. (Auth.)

E-51335

Mackensen, A., Berggren, W.A., **Paleogene benthic foraminifers from the southern Indian Ocean (Kerguelen Plateau): biostratigraphy and paleoecology**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.603-630, Refs. p.619-620.

DLC QE39.T49b

Benthic foraminifers were studied from lower Paleocene through Upper Oligocene sections from Sites 747 and 748. The composition of the benthic foraminifer species suggests a middle to lower bathyal (600-2000 m) paleodepth during the Neogene and a probable upper abyssal (2000-3000 m) paleodepth during the Paleocene at Site 747. Site 748 is thought to have remained at middle to lower bathyal paleodepths throughout the Cenozoic. Principal component analysis distinguished 4 major benthic foraminifer assemblages: a Paleocene *Stensioina beccariformis* assemblage at Sites 747 and 748, an Early Eocene *Nuttallides truempyi* assemblage at lower bathyal Site 747, an Early through Middle Eocene *Stilostomella-Lenticulina* assemblage at middle bathyal Site 748, and a latest Eocene through Oligocene *Cibicidoides-Astrononion pusillum* assemblage at both sites. Major benthic foraminifer changes, as indicated by the principal components and first and last appearances, occurred at or close to the Paleocene/Eocene boundary, and in the Late Eocene close to the Middle/Late Eocene boundary. (Auth.)

E-51336

Berggren, W.A., **Neogene planktonic foraminifer magneto-biostratigraphy of the southern Kerguelen Plateau (Sites 747, 748, and 751)**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.631-647, 22 refs.

DLC QE39.T49b

With the exception of a brief (2 m.y.) Late Miocene-Early Pliocene hiatus, an essentially complete Neogene record was recovered on the Kerguelen Plateau in a calcareous biofacies. The stratigraphic distribution of about 30 taxa of Neogene planktonic foraminifers recovered at Sites 747, 748, and 751 (central and southern Kerguelen Plateau) is recorded. Faunas are characterized by low diversity and high dominance and exhibit a gradual decline in species numbers (reflecting a concomitant increase in biosiliceous forms, particularly diatoms) from about 10 in the Early Miocene to 5-8 in the Middle Miocene, 3-4 in the Late Miocene, to essentially a lone (*Neoglobobulimina pachyderma*) form in the Pliocene-Pleistocene. A provisional sevenfold biostratigraphic zonation has been formulated that, together with the recovery of a representative Neogene magnetostratigraphic record, may ultimately lead to a correlation with low-latitude magnetobiostratigraphies. The initial appearance of *N. pachyderma* is associated with magnetic polarity Chron (MPC)4 (7 Ma) and MPC 4A (>8 Ma) at Sites 747 and 751, respectively. (Auth.)

E-51337

Mackensen, A., **Neogene benthic foraminifers from the southern Indian Ocean (Kerguelen Plateau): biostratigraphy and paleoecology**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.649-673, Refs. p.665-667.

DLC QE39.T49b

Benthic foraminifers were studied quantitatively in 120 Lower Miocene through Upper Pleistocene samples from ODP Sites 747, 748, and 751, Kerguelen Plateau. Principal component analysis on the census data of the most abundant 92 taxa helped to identify 8 benthic foraminifer assemblages. These assemblages were compared with Holocene faunas from southern high latitudes to reconstruct paleoenvironmental conditions. Middle Lower Miocene sediments are characterized by a *Uvigerina hispidocostata* assemblage, indicating high paleoproductivity and/or not well-ventilated bottom water. From late Early to late Middle Miocene time, the southern Kerguelen Plateau was bathed by a young, well-oxygenated and carbonate-aggressive water mass, as indicated by a *Nuttallides umbonifer*-dominated assemblage. During late Middle Miocene time, an *Astrononion pusillum* assemblage took over for only about 1 m.y. The latest Miocene through middle Late Pliocene benthic foraminifer assemblage was characterized by *Epistominella exigua* and strong carbonate dissolution, indicating very high biosiliceous production, and this in turn may indicate the formation and paleoposition of an Antarctic Polar Frontal Zone. From the late Late Pliocene, a *Trifarina angulosa* assemblage (indicative today of sandy substrate and vigorous bottom currents) strongly dominated the fauna up to the Late Pleistocene, when *Bulimina aculeata* became an important and partly domi-

nating constituent of the fauna. This is interpreted as the faunal response to the decreased winnowing force (bottom current velocities) of the Antarctic Circumpolar Current during periods of global climatic amelioration and raised sea level. (Auth. mod.)

E-51338

Mackensen, A., Spiegler, D., **Middle Eocene to Early Pliocene *Bolboforma* (algae?) from the Kerguelen Plateau, southern Indian Ocean**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.675-682, 35 refs.

DLC QE39.T49b

Bolboforma were recovered from all sites of ODP Leg 120 to the central Kerguelen Plateau. Eight Paleogene taxa, ranging from Middle Eocene through Early Oligocene, and 9 Neogene taxa, ranging from late Middle Miocene through earliest Pliocene, were recognized. A *Bolboforma* zonation recently proposed for the Middle Paleogene of the Leg 114 sites from the southern Atlantic Ocean is applicable to the Leg 120 material from the southern Indian Ocean. The age of zonal boundaries is consistent within a resolution of 1 m.y. The ranges of some marker species have been extended, causing a redefinition of some Late Eocene zonal boundaries. The revised zonal scheme agrees well with the Paleogene occurrence of *Bolboforma* species from the Leg 113 sites in the eastern Weddell Sea. This and the consistent presence of *Bolboforma* in Paleogene cores from the antarctic ODP legs promise that *Bolboforma* stratigraphy will become a useful tool for the subdivision of sequences across the Eocene/Oligocene boundary from southern high latitudes. (Auth. mod.)

E-51339

Harwood, D.M., Maruyama, T., **Middle Eocene to Pleistocene diatom biostratigraphy of southern ocean sediments from the Kerguelen Plateau, Leg 120**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.683-733, Refs. p.695-699.

DLC QE39.T49b

The biostratigraphic distribution and abundance of Lower Oligocene to Pleistocene diatoms is documented from Holes 747A, 747B, 748B, 749B, and 751A drilled during ODP Leg 120 on the Kerguelen Plateau. The occurrence of Middle and Upper Eocene diatoms is also documented, but these are rare and occur in discrete intervals. The recovery of several Oligocene to Pleistocene sections with minimal coring gaps, relatively good magnetostratigraphic signatures, and mixed assemblages of both calcareous and siliceous microfossils makes the above four Leg 120 sites important biostratigraphic reference sections for the southern ocean and antarctic continent. A high-resolution diatom zonation divides the last 36 m.y. into 45 zones and subzones. This zonation is built upon an existing biostratigraphic framework developed over the past 20 yr of southern ocean/antarctic deep-sea coring and drilling. High-resolution diatom stratigraphy, combined with good to moderately good magnetostratigraphic control, led to the recognition of more than 10 intervals where hiatuses dissect the Oligocene-Pleistocene section on the Kerguelen Plateau. The authors propose 12 new diatom taxa and 6 new combinations in this paper; an additional 41 unknown or poorly documented diatoms are treated with informal nomenclature. (Auth. mod.)

E-51340

Takemura, A., **Radiolarian Paleogene biostratigraphy in the southern Indian Ocean, Leg 120**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.735-756, Refs. p.747-748.

DLC QE39.T49b

During ODP Leg 120, an almost complete Paleogene sediment section on the Kerguelen Plateau in the southern Indian Ocean was recovered. The biostratigraphy of radiolarians from these sediments at Sites 748 and 749 is studied. A biostratigraphic framework established in low and middle latitudes is not applicable because of the absence of most zonal marker species. Biogenic opal is present only in Middle Eocene to

Oligocene sediments, and three new zones—*Lychnocanoma conica*, *Axoprimum(?) irregularis*, and *Eucyrtidium spinosum*—are proposed. The Paleogene antarctic radiolarian fauna is different from that in low and middle latitudes. Three new species, *A. irregularis*, *Eucyrtidium cheni*, and *E. spinosum*, are described. (Auth.)

E-51341

Abelmann, A., **Early to Middle Miocene radiolarian stratigraphy of the Kerguelen Plateau, Leg 120**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.757-783, Refs. p.777-778.

DLC QE39.T49b

Early to Middle Miocene radiolarian assemblages were examined at three sites (747, 748, and 751) that were cored during ODP Leg 120 south of the present Polar Frontal Zone on the Kerguelen Plateau (Indian sector of the southern ocean). The radiolarian biostratigraphic study relies on a radiolarian zonation recently developed on Leg 113 materials in the Atlantic sector of the southern ocean, which is correlated with the geomagnetic time scale. New radiolarian biostratigraphic data also considering the established geomagnetic polarity record were used to improve and emend the age calibration of some Lower Miocene radiolarian zones and a redefined Middle Miocene radiolarian zonation is proposed. Based on these results, a revised age assignment of the Lower Miocene sections drilled at Leg 113 Sites 689 and 690 is proposed. (Auth.)

E-51342

Lazarus, D., **Antarctic Neogene radiolarians from the Kerguelen Plateau, Legs 119 and 120**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.785-809, Refs. p.798-800.

DLC QE39.T49b

Abundant, generally well-preserved radiolarians from Sites 737, 744, 745, 746, 747, 748, and 751 were used in stratigraphic analysis of Neogene, and particularly Middle Miocene to Holocene, Kerguelen Plateau sediments. The composite Kerguelen section is more complete than the Weddell Sea sections recovered by Leg 113, and the radiolarians are better preserved. Leg 113 radiolarian zonations of Weddell Sea sites were applicable with only slight modification, and three new zones—*Siphonosphaera vesuvius*, *Acrosphaera? labrata*, and *Amphymenium challengeriae*—are proposed for the latest Miocene. Geologic age estimates are given for all radiolarian zones used. Major hiatuses affecting most sites were seen within the Middle Miocene, in the latest Miocene, and latest Pliocene. Five new species are described: *A. labrata*, *A. mercurius*, *S. vesuvius*, *Actinomma? magnifenestra*, and *Helotholus? haysi*. (Auth.)

E-51343

McCartney, K., Harwood, D.M., **Silicoflagellates from Leg 120 on the Kerguelen Plateau, southeast Indian Ocean**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.811-831, Refs. p.826-827.

DLC QE39.T49b

The biostratigraphic distribution and abundance of Eocene to Pleistocene silicoflagellates is documented from ODP Leg 120 Holes 747A, 748A, 748B, 749B, and 751A on the central Kerguelen Plateau. Well-preserved silicoflagellates are reported here from the Middle Eocene *Dictyocha grandis* Zone to the Pleistocene *Distephanus speculum speculum* Zone. Assemblage diversity and abundance is variable, with many intervals either barren of silicoflagellates or containing only limited numbers. (Auth.)

E-51344

Ahlbach, W.J., McCartney, K., **Siliceous sponge spicules from Site 748**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University,

1992, p.833-837, 8 refs.

DLC QE39.T49b

Siliceous sponge spicules are present and often diverse in sediments drilled by ODP Leg 120. The sponge spicule assemblages are tabulated for Holes 748A and 748B. Neogene assemblages consist mostly of monaxons, whereas chelae, amphidiscs, discorhabds, polyaxons, and other spicule morphologies are often abundant in middle Eocene to Upper Oligocene sediments. (Auth.)

E-51345

Zachos, J.C., Berggren, W.A., Aubry, M.P., Mackensen, A., **Isotope and trace element geochemistry of Eocene and Oligocene foraminifers from Site 748, Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.839-854, Refs. p.852-854.

DLC QE39.T49b

Stable carbon and oxygen isotope analyses were conducted on well-preserved planktonic and benthic foraminifers from a continuous Middle Eocene to Oligocene sequence at ODP Site 748 on the Kerguelen Plateau. Benthic foraminifer $\delta^{18}\text{O}$ values show a 1.0 per mill increase through the Middle and Upper Eocene, followed by a rapid 1.2 per mill increase in the lowermost Oligocene (35.5 Ma). Surface-dwelling planktonic foraminifer $\delta^{18}\text{O}$ values increase in the lowermost Oligocene, but only by 0.6 per mill whereas intermediate-depth planktonic foraminifers show an increase of about 1.0 per mill. Benthic foraminifer $\delta^{13}\text{C}$ values increase by 0.9 per mill in the lowermost Oligocene at precisely the same time as the large $\delta^{18}\text{O}$ increase, whereas planktonic foraminifer $\delta^{13}\text{C}$ values show little or no change. Site 748 oxygen isotope and paleontological records suggest that southern Indian Ocean surface and intermediate waters underwent significant cooling from the Early to Late Eocene. Records indicate that 0.3 to 0.4 per mill of the Early Oligocene $\delta^{18}\text{O}$ increase was ice-volume related. (Auth. mod.)

E-51346

Wright, J.D., Miller, K.G., **Miocene stable isotope stratigraphy, Site 747, Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.855-866, Refs. p.863-864.

DLC QE39.T49b

The authors correlated Miocene $\delta^{18}\text{O}$ increases at ODP Site 747 with $\delta^{18}\text{O}$ increases previously identified at North Atlantic Deep Sea Drilling Project Sites 563 and 608. The $\delta^{18}\text{O}$ increases have been directly tied to the Geomagnetic Polarity Time Scale (GPTS) at Site 563 and 608, and thus the correlations at Site 747 provide a second-order correlation to the GPTS. Comparison of the oxygen record at Site 747 with records at Sites 563 and 608 indicates that three as-yet-undescribed global Miocene $\delta^{18}\text{O}$ increases may be recognized and used to define stable isotope zones. The $\delta^{18}\text{O}$ maxima associated with the bases of Zones Mila, Milb, and Mi7 have magnetochronologic age estimates of 21.8, 18.3, and 8.5 Ma, respectively. The correlation of a $\delta^{18}\text{O}$ maximum at 70 mbsf at Site 747 to the base of Miocene isotope Zone Mi3 (13.6 Ma) provides a revised interpretation of 4 Middle Miocene normal polarity intervals observed between 77 and 63 mbsf at Hole 747A. Oxygen isotope stratigraphy indicates that the reversed polarity interval at 70 mbsf, initially interpreted as Chronozone C5Aa, should be C5ABr. Instead of a concatenated Chronozone C5AD-C5AC with distinct Chronozones, C5AB, C5AA, and C5A (as in the preliminary interpretation), $\delta^{18}\text{O}$ stratigraphy suggests that these normal polarity intervals are Chronozones C5AD, C5AC, and C5AB, whereas Chronozones C5AA-C5A are concatenated. This interpretation is supported by the $\delta^{13}\text{C}$ correlations. (Auth.)

E-51347

Mackensen, A., Barrera, E., Hubberten, H.W., **Neogene circulation in the southern Indian Ocean: evidence from benthic foraminifers, carbonate data, and stable isotope analyses (Site 751)**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by

E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.867-878, Refs. p.877-878.

DLC QE39.T49b

Lower Miocene through Upper Pleistocene benthic foraminifer assemblage records from ODP Site 751 on the southern Kerguelen Plateau were combined with benthic and planktonic foraminifer oxygen and carbon isotope records and high-resolution CaCO_3 data from the same site. Implications for the Neogene productivity and paleoceanography of the southern Indian Ocean are discussed. Coinciding with a lower Middle Miocene hiatus from 14.2 to 13.4 Ma, there was a rapid increase in benthic $\delta^{18}\text{O}$ values by 1.2 per mill. This distinct increase occurs in Middle Miocene benthic foraminifer oxygen isotope curves from all oceans. No major change, however, in benthic foraminifer faunal composition occurred in this period of growth of the antarctic ice cap and cooling of deep ocean waters (14.9-14.2 Ma). A drastic change in benthic foraminifer faunas coincided with a hiatus from 8.4 to 5.9 Ma. Shortly after this hiatus, in the latest Miocene, the CaCO_3 content of the sediments dropped from 75 to 0%. From that time (about 5.8 Ma) through the Early Pliocene, Site 751 has been situated beneath a high biogenic siliceous productivity zone. (Auth. mod.)

E-51348

Munsch, M., et al, **Structure and evolution of the central Kerguelen Plateau deduced from seismic stratigraphic studies and drilling at Site 747**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.881-893, 28 refs.

DLC QE39.T49b

The structure and evolution of the central Kerguelen Plateau (CKP), located between 54-57S and 61-84E, is derived from the seismic stratigraphic interpretation of multichannel seismic data and from ODP results at Site 747. The CKP formed 120-110 m.y. ago by excessive volcanic activity at the axis of the spreading ridge that separated India from Antarctica. At 72 Ma, a major pre-rift tectonic episode stretched the basement of the CKP in an east-west direction; the 77E Graben consists of several rift units, somewhat similar to the structure observed in the East African continental rift system. At 42 Ma, the breakup between the Kerguelen Plateau and Broken Ridge was accompanied by a period of nonsedimentation of about 15 m.y. duration. After the breakup, the sedimentation was generally continuous but evolved during the Pliocene-Pleistocene in response to climate changes. (Auth.)

E-51349

Fritsch, B., et al, **Evolution of the southern Kerguelen Plateau deduced from seismic stratigraphic studies and drilling at Sites 748 and 750**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.895-906, Refs. p.905-906.

DLC QE39.T49b

The evolution of the Raggatt Basin in the southern Kerguelen Plateau since the Late Cretaceous was deduced from seismic stratigraphic interpretations of the multichannel seismic data and ODP results at Sites 748 and 750. Synthetic seismograms were built using *in situ* and corrected core velocity values. Corrections were based on Wyllie's law, and exponential variations of porosity were calculated from logging data at Site 750. The synthetic seismograms in conjunction with the seismic sections allowed the authors to correlate the lithologic units and the seismic sequences. After the emplacement of oceanic basaltic basement at 110 Ma, the Late Cretaceous history of the Raggatt Basin was controlled by two rifting episodes at 88 Ma to the east and at 66 Ma to the west. The first rifting episode, with an axis of extension striking northwest-southeast, formed the eastern flank of the southern Kerguelen Plateau. The second rifting episode, along a north-south axis, formed the 77E Graben. At 45-42 Ma, the separation by seafloor spreading of the Kerguelen Plateau-Labuan Basin and Broken Ridge-Diamantina Zone marks a third rifting episode, which was recorded on the southern Kerguelen Plateau by erosion. (Auth.)

E-51350

Fritsch, B., Munsch, M., Fezga, F., **Analysis of noise on digital**

sonic log data at Leg 120 sites. Derived synthetic seismogram and correlation with MCS data at Site 747, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.907-916, 10 refs.

DLC QE39.T49b

During Leg 120, weather conditions and time constraints restricted logging operations to Sites 747 and 750; only the seismic-stratigraphic combination was run at these sites. For some intervals, the sonic digital tool produced extremely noisy velocity logs that made interpretation of the data very difficult. Three types of noise were observed: phase skipping, oscillations caused by noncompensated heave, and discrete aberrant velocity values. The heave-related oscillations recorded on the velocity logs were eliminated by deriving a simple model simulating the tool movement. The aberrant velocity values, essentially caused by failures in recording the signal from one of the two transmitters, were eliminated by inspection of the individual waveforms using an interactive software package. This software program was also used to pick the compressional arrival time. A composite velocity log accounting for all these corrections and complemented for the unlogged part of the hole with the core-measured velocities was used to derive a synthetic seismogram at Site 747. The synthetic seismogram was correlated with a multi-channel seismic reflection profile and the lithologic units, which yielded four seismic sequences that could be identified with the K2-K3, P1-P2, PN1, and NQ1 sequences of the Raggatt Basin in the southern Kerguelen Plateau. (Auth.)

E-51351

Royer, J. Y., Coffin, M.F., **Jurassic to Eocene plate tectonic reconstructions in the Kerguelen Plateau region**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.917-928, Refs. p.923-925.

DLC QE39.T49b

A series of preliminary reconstructions is given for the Kerguelen Plateau region from the Late Jurassic to the Eocene that summarize and review the outstanding questions about its plate tectonic evolution. The development of the Indian and adjacent southern oceans began in Middle to Late Jurassic time with the breakup of Gondwana. Fracture zone trends interpreted from satellite (SEASAT and GEOSAT) altimetry, and marine seismic, gravity, and magnetic data have been combined with crustal dates to produce kinematic models of the plates through time. Between the Jurassic and the Late Cretaceous, time controls on the plate tectonic evolution of the region are few. Mesozoic marine magnetic anomalies off the shore of East Africa, Antarctica, and Western Australia document plate motions during the interval; however, extensive areas of oceanic crust from which no anomalies have been identified, including that created during the Cretaceous Long Normal Polarity Interval, and a dearth of fracture zones prevent detailed links with the much better defined plate kinematic synthesis for the past 84 m.y. The Kerguelen Plateau/Broken Ridge complex was emplaced at about 110 Ma in a region flanked by Greater India, Australia, and Antarctica. Between then and about 43 Ma, when seafloor spreading between the Kerguelen Plateau and Broken Ridge began, the model presented includes transform motions between the northern and southern sectors of the Kerguelen Plateau. (Auth. mod.)

E-51352

Munsch, M., et al, **Breakup and seafloor spreading between the Kerguelen Plateau-Labuan Basin and the Broken Ridge-Diamantina Zone**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.931-944, Refs. p.943-944.

DLC QE39.T49b

The development of rifting between the Kerguelen Plateau-Labuan Basin and the Broken Ridge-Diamantina Zone and the evolution of the southeast Indian Ridge is summarized as follows: from 96 to 46 Ma, slow spreading occurred between Antarctica and Australia; the Kerguelen Plateau, Labuan Basin, and Diamantina Zone stretched at 88-87 Ma and 69-66 Ma; from 46 to 43 Ma, the breakup between the southern

Kerguelen Plateau and the Diamantina Zone propagated westward at a velocity of about 300 km/m.y.; the breakup between the northern Kerguelen Plateau and Broken Ridge occurred between 43.8 and 42.9 Ma; after 43 Ma, volcanic activity developed on the northern Kerguelen Plateau and at the southern end of the Ninetyeast Ridge; lava flows obscured the boundaries of the northern Kerguelen Plateau north of 48S and of the Ninetyeast Ridge south of 32S, covering part of the newly created oceanic crust; since 43 Ma, the southeast Indian Ridge has manifested a typical intermediate spreading rate (25-45 km/m.y.). (Auth. mod.)

E-51353

Coffin, M.F., **Subsidence of the Kerguelen Plateau: the Atlantis concept**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.945-949, 32 refs.

DLC QE39.T49b

ODP Leg 119 and 120 results from the southern Kerguelen Plateau provide important constraints on the subsidence history of this large igneous province. Following emplacement of the plateau at about 110 Ma, sedimentary facies indicate that portions of the feature remained above sea level or in shallow water for up to 40 m.y. The author uses previously determined age-depth relationships for oceanic lithosphere to determine the level of emplacement for five sites on the southern Kerguelen Plateau. If thermal subsidence was the dominant tectonic process affecting the southern Kerguelen Plateau following emplacement, then large portions of the feature were emplaced and began subsiding far above sea level. This resulted in significant erosion and redeposition of volcanic material mixed with biogenic sediment, and a gradual development of facies from terrestrial through terrigenous to shallow water and pelagic. The author proposes the "Atlantis" concept for this early evolution of the Kerguelen Plateau and of other large igneous provinces that produced a sedimentary record intermediate between continental and oceanic. (Auth.)

E-51354

Watkins, D.K., et al, **Paleontology of the Cretaceous of the central Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.951-960, 12 refs.

DLC QE39.T49b

A synthesis of the Cretaceous calcareous nannofossil, foraminifer, terrestrial and marine palynomorph, macrofauna, and macroflora data from drill sites on the central Kerguelen Plateau indicates a complex sedimentary history spanning the Albian through the Maestrichtian. Non-marine Albian sediments from the eastern part of the central plateau record the initial colonization and subsequent succession of plant communities on the basaltic islands left by edifice-building events during the Early Cretaceous. Disconformity-bounded sequences of pelagic calcareous sediment accumulated there throughout the Cenomanian to Early Campanian. Following a widespread hiatus of sedimentation in the mid-Campanian, more continuous pelagic sedimentary sequences accumulated on the eastern and northern parts of the central plateau. This chalk sedimentation was abruptly terminated by the introduction of volcanoclastic debris flows in the northern area, but continued uninterrupted on the eastern margin of the central plateau. The western part of the central plateau entered the marine realm during the Cenomanian, although it remained at shallow (neritic) depths throughout the Cenomanian to Coniacian. A bryozoan-molluscan-foraminifer bank and bank-related facies complex developed in the western central plateau during the Early Campanian. Sedimentation in this complex was interrupted during the mid-Campanian, then resumed during the Late Campanian. (Auth.)

E-51355

Zachos, J.C., et al, **Chemobiostratigraphy of the Cretaceous/Paleocene boundary at Site 750, southern Kerguelen Plateau**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.961-977, Refs. p.972-974.

DLC QE39.T49b

An integrated biostratigraphic and stable isotope investigation was conducted on a high-latitude sequence across the Cretaceous/Paleogene (K/P) boundary recovered in Hole 750A in the southern Indian Ocean. The sequence consists of nannofossil chalk and is discontinuous across the boundary; missing is an estimated 0.3 m.y. Late Maestrichtian and Early Danian interval. Nonetheless, because calcareous nannofossil Zones NP1 and NP2 are well-developed, micropaleontological studies of the sequence have yielded a detailed record of Danian high-latitude microplankton evolution. In addition, stable carbon isotope analyses of planktonic and benthic foraminifer and bulk samples provide a record of Late Maestrichtian and Early Danian surface- and deep-water carbon isotope variations. Together, the carbon isotope and carbonate accumulation records serve as an index of regional marine net productivity across the boundary. Earliest Danian nannoplankton assemblages consisted mainly of persistent genera that were generally rare or absent in the Upper Cretaceous at Hole 750A. However, by 0.5-0.6 m.y. after the boundary, newly evolving Danian taxa became dominant. The absolute timing and magnitude of Late Maestrichtian and Early Danian biotic and geochemical changes in the southern Indian Ocean were similar to those recorded in other pelagic K/P boundary sequences from low- and mid-latitude Atlantic and Pacific sites, indicating that these events were ubiquitous. (Auth. mod.)

E-51356

Wei, W., Villa, G., Wise, S.W., Jr., **Paleoceanographic implications of Eocene-Oligocene calcareous nannofossils from Sites 711 and 748 in the Indian Ocean**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.979-999, Refs. p.996-998.

DLC QE39.T49b

An Eocene-Oligocene calcareous nannofossil biostratigraphic framework for ODP Site 748 in the southern Indian Ocean is established, which provides a foundation for this and future quantitative biogeographic studies. This biostratigraphic analysis, together with quantitative nannofossil data, enables a reinterpretation of the preliminary magnetostratigraphy and a new placement for magnetic Subchron C13N in the lowermost Oligocene. Calcareous nannofossil species diversity is low at Site 748 relative to lower latitude sites, with about 13 taxa in the Middle Eocene, gradually decreasing to about 6 in the Late Oligocene. There is, however, no apparent mass extinction at any stratigraphic level. Similarly, no mass extinctions were recorded at or near the Eocene/Oligocene boundary at Site 711 in the equatorial Indian Ocean. Species diversity at the equatorial site is significantly higher than at Site 748, with a maximum of 39 species in the Middle Eocene and a minimum of 14 species in the Late Oligocene. The abundance patterns of nannofossil taxa are also quite different at the two sites. An abrupt increase in the abundance of cool-water taxa (from about 20 to over 90%) occurred from 36.3 to 35.9 Ma at high-latitude Site 748. Coincident with this event was a 1.0 per mill positive shift in the $\delta^{18}\text{O}$ value of planktonic foraminifers and the occurrence of ice-rafted debris. (Auth. mod.)

E-51357

Wise, S.W., Jr., et al, **Paleogene glacial history of Antarctica in light of Leg 120 drilling results**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.1001-1030, Refs. p.1025-1028.

DLC QE39.T49b

The Paleogene glacial history of Antarctica has been inferred largely from indirect evidence of glaciation gathered from the oceans beyond that continent. This evidence includes the "proxy" stable isotopic record from the world's oceans; the occurrence of ice-rafted debris (IRD) in the southern ocean; inflections in sea-level curves; the presence of hiatuses in the deep-sea record; and changes in clay mineral assemblages, in the diversities of microfossil assemblages, and in the steepness of latitudinal biotic gradients. ODP Leg 120 has added an important dimension to this growing body of evidence through the discovery of lowest Oligocene IRD at Site 740 on the southern Kerguelen Plateau, at a record distance north of the antarctic continent and within a pelagic biosiliceous-carbonate ooze sequence that has yielded a complementary oxygen isotope record of the cryospheric event. The authors deduce that

an ice sheet reached sea level during the earliest Oligocene (35.8-36.0 Ma) and that the effect was immediate and profound. In addition to the IRD, this event was manifested at Site 748 by a dramatic cooling of the surface waters surrounding the continent as indicated by a sharp increase in the percentage of cold-water calcareous nannoplankton, an increase in planktonic foraminiferal $\delta^{18}\text{O}$ values, and an increase in the percentage of biosiliceous material in the sediment. (Auth. mod.)

E-51358

Harwood, D.M., et al, **Neogene integrated magnetobiostratigraphy of the central Kerguelen Plateau, Leg 120**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.1031-1052, 16 refs.

DLC QE39.T49b

Neogene biostratigraphic and magnetostratigraphic data are compiled from Holes 747A, 748B, and 751A drilled on the southern Kerguelen Plateau during ODP Leg 120. Neogene sections have excellent to good magnetostratigraphic signatures in many intervals. This, in addition to minimal coring gaps and the occurrence of mixed assemblages of both calcareous and siliceous microfossil assemblages, makes these valuable biostratigraphic reference sections for intra- and extraregional correlation. This paper combines the sequence of biostratigraphic events reported from diatom, radiolarian, planktonic foraminifer, calcareous nannofossil, and silicoflagellate studies of Leg 120 sediments. It correlates microfossil datums with the geomagnetic polarity time scale to test existing age estimates and to refine biostratigraphic age controls for the southern high latitudes. Significant biostratigraphic datums are presented in a series of age-depth plots. Numerous hiatuses are clearly identified through this approach, and the positions of lesser disconformities are suggested. This paper compiles Leg 120 biostratigraphic and magnetostratigraphic data for use in future syntheses of southern high latitude biostratigraphy and presents an age model for Leg 120 Neogene sediments. (Auth. mod.)

E-51359

Pratson, E.L., Anderson, R.N., Tivy, J., **Reprocessed well logs from Hole 747C used in local and regional correlation**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.1053-1061, 11 refs.

DLC QE39.T49b

A single seismic stratigraphic logging string, which comprised the natural gamma-ray, phasor induction, and array sonic tools, recorded log data at Hole 747C. The data have been reprocessed at shore-based computing centers and the results are presented in this study. The reprocessed logs were used for several purposes. A lithologic column was calculated at Hole 747C from natural gamma-ray and resistivity logs. A carbonate curve derived from the column was used for local correlation between holes at Site 747. The Th/U ratio was used to detect ash layers and so to provide regional correlation between Site 738 of Leg 119, Sites 747 and 750 of Leg 120, and Site 752 of Leg 121. The ash layer frequency was used to infer activity in the Kerguelen hotspot. (Auth.)

E-51360

Quilty, P.G., **Unsuccessful search for fish otoliths, Cretaceous and younger: Leg 120, southern Indian Ocean**, Proceedings of the Ocean Drilling Program, Vol. 120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.1065-1066, 6 refs.

DLC QE39.T49b

Otoliths were sought in hundreds of samples from Cretaceous to Holocene sections at all sites (747-751) drilled by ODP Leg 120 on the Kerguelen Plateau. None were recovered. In the younger part of the sequence, the absence is a result of the composition of nototheniid otoliths, which is dominantly aragonite. (Auth.)

E-51361

Breza, J.R., **X-ray mineralogy data from Kerguelen Plateau, Leg 120, Site 751**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.1067-1071, 5 refs.

DLC QE39.T49b

The purpose of this paper is to present data from a clay mineralogy investigation of the sediments analyzed for ice-rafted debris (IRD) from Hole 751A. This data is significant in that the change in clay mineralogy may provide information about the Neogene evolution of climate and oceanic circulation near the Kerguelen Plateau and adjacent to Prydz Bay. Site 751 consists of two lithologic units. Unit 1 is composed of 40 m of Upper Pleistocene to Lower Pliocene diatom ooze with varying amounts of IRD and foraminifers. Unit II consists of 126 m of Upper to Lower Miocene diatom nannofossils ooze, with nannofossils as the primary sedimentary component.

E-51362

Howard, W.R., **Carbonate sedimentation during the Miocene and Pliocene on the southern Kerguelen Plateau (Site 751)**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.1073-1077, 11 refs.

DLC QE39.T49b

Detailed records of % calcium carbonate and calcium carbonate mass accumulation rate (MAR) for Site 751, located on the southern Kerguelen Plateau, are presented. The shallow-water site contains a Neogene section with well-preserved carbonate sediments. These sediments record variations in the oceanography of the antarctic surface waters. Carbonate sedimentation patterns reflect changing modes of biogenic sedimentation in the Miocene and Pliocene antarctic ocean. Drilling at Site 751 recovered 166 m of early Miocene to Pleistocene siliceous and calcareous biogenic oozes. Three hiatuses, however, were detected: one between 14.8 and 12 Ma, another between 8.9 and 6.7 Ma, and a third between 5.08 and 5.36 Ma. Sedimentation rates were about 20 m/m.y. throughout the Miocene and up to 10 m/m.y. during the Pliocene and Pleistocene. Key events in the depositional history are summarized. (Auth. mod.)

E-51363

Quilty, P.G., **Studies into the paleontology of the Cretaceous of the Indian Ocean basin**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.1079-1090, Refs. p.1089-1090.

DLC QE39.T49b

The evolution of the Indian Ocean during the Cretaceous, and the ocean's features, are briefly reviewed. Results of scientific ocean drilling of Cretaceous sequences up through Leg 120 are summarized Leg by Leg and Site by Site.

E-51364

Wei, W., **Calcareous nannofossil stratigraphy and reassessment of the Eocene glacial record in subantarctic piston cores of the southeast Pacific**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.1093-1104, Refs. p.1099-1101.

DLC QE39.T49b

This study provides the first detailed documentation of calcareous nannofossil assemblages in Eocene subantarctic *Eltanin* piston cores recovered from the southeast Pacific Ocean. These *Eltanin* cores are important because they have been reported to contain ice-rafted quartz. The present study confirms Early and Middle Eocene ages for the cores and dates them more precisely using calcareous nannofossils. Semi-quantitative study of the nannoflora indicates that they are of a warmer water character than those from the higher latitudes (such as Falkland Plateau, Maud Rise, and Kerguelen Plateau). This study concludes that

it is unlikely for the ice-rafted quartz in the Eocene sections to be down-core contaminants from the overlying Neogene sediment and suggests that the grains are probably the result of Eocene ice-rafting from Antarctica when the Drake Passage was closed and water circulation patterns were different from those of today. (Auth.)

E-51365

Wei, W., **Updated nannofossil stratigraphy of the CIROS-1 core from McMurdo Sound (Ross Sea)**, Proceedings of the Ocean Drilling Program, Vol.120. Scientific results. Part 2. Central Kerguelen Plateau, edited by E.M. Barbu, College Station, TX, Texas A and M University, 1992, p.1105-1117, Refs. p.1115-1116.

DLC QE39.T49b

Semi-quantitative data of calcareous nannofossil species abundance were collected for 31 samples from 380.00 to 696.61 m below sea floor (mbsf) in the CIROS-1 core from the western McMurdo Sound. This core has provided the most complete record of Paleogene glacial history of Antarctica. Only half of the samples yielded calcareous nannofossils and species diversity is generally low. However, several samples contain diverse assemblages and nannofossil zonal markers. *Isthmolithus recurvus* was found between 406.57 and 681.16 mbsf. This species has an age range of about 35-39 Ma in the mid to high latitudes, as calibrated previously by magnetostratigraphy at a number of DSDP/ODP sites. The interval from 406.57 to 681.16 mbsf can be assigned to the Late Eocene-earliest Oligocene (about 35-39 Ma), and the sample at 391.85 mbsf, which still contains *Reticulofenestra hillae* and *R. umbilica* but does not contain *I. recurvus*, is identified as Early Oligocene age (about 33-34 Ma). This represents an age refinement of the previous nannofossil biostratigraphy, where the interval from 385.77 to 690.40 mbsf was dated as Middle Eocene-Early Oligocene. (Auth. mod.)

E-51367

Gordillo, S., Coronato, A.M.J., Rabassa, J.O., **Late Quaternary evolution of a subantarctic paleofjord, Tierra del Fuego**, *Quaternary science reviews*, Dec. 1993, 12(10), p.889-897, 37 refs.

Lago Roca-Lapataia valley, Tierra del Fuego, is a paleofjord that was occupied by a valley-glacier system during the glacial maximum of the late Pleistocene (estimated ca. 18-20 ky BP). Deglaciation began before 10,080 +/- 270 BP. The marine fauna in several marine terraces found in the area shows that early-middle Holocene climatic conditions were basically the same as at present. Species found are characteristic of cold and shallow waters, although minor temperature fluctuations cannot be ruled out for this period. A recent radiocarbon date of 7518 +/- 58 BP on *Chlamys patagonica* confirms that Lago Roca was transformed into a fjord ca. 7500-8000 BP. The sea reached its maximum level of 8-10 m a.s.l. around 6000 BP and at 4000-4500 BP was at least above 6 m a.s.l. Later, when sea level fell, Lago Roca was occupied by fresh water and was no longer tidal. The relative land-sea positions during this period are a consequence of combined eustatic and neotectonic processes. (Auth. mod.)

E-51372

Herzfeld, U.C., Brodscholl, A.L., **On the geologic structure of the Explora Escarpment (Weddell Sea, Antarctica) revealed by satellite and shipboard data evaluation**, *Marine geophysical researches*, Oct. 1994, 16(5), p.325-345, 55 refs.

Bathymetric, gravity, and magnetic data from antarctic expeditions with RV *Polarstern* and satellite altimeter data from the Geosat Geodetic Mission are analyzed using methods from geostatistics and geophysical inverse theory. The Explora Escarpment represents the edge between the Antarctic Continental Shelf and the Weddell Abyssal Plain. It is an important link in the reconstruction of Gondwana breakup, but a feature as large as the 2000 m deep Wegener Canyon was only discovered in 1984, when extensive bathymetric, gravimetric, and magnetic surveys with RV *Polarstern* began. Geostatistics, the theory of regionalized variables, is applied to integrate dense surveys of Wegener Canyon and sparse observations in adjacent areas into maps with full coverage of the 230 km by 330 km area at 10-20W/70-72S. The resultant high-resolution bathymetric and gravity maps reveal detailed structures of the Explora Escarpment. Using geophysical inversion, the gravity terrain

effect is calculated. Satellite data are used for their better coverage, but have much lower resolution. Nevertheless, the structures of Wegener Canyon and other more prominent features correlate well with Geosat altimeter data. While it was initially supposed that Wegener Canyon is purely an erosional structure, the magnetic map now provides evidence of its tectonic origin. (Auth. mod.)

E-51402

Bryan, J.R., **Antarctic Marine Geology Research Facility 1991-1992**, *Antarctic journal of the United States*, 1992, 27(5), p.341-342, 13 refs.

The 1991-1992 project year (June 1 to May 31, 1992) was a time of change for the National Science Foundation's Antarctic Marine Geology Research Facility at Florida State University (FSU). Dennis S. Cassidy, curator of the facility for 28 years, retired at the end of Sep. 1991, and a new curator was hired by the FSU Department of Geology. The mission and activities of the facility have continued with little interruption and are summarized. From the extensive collection of cored, dredged, trawled, and grabbed sediments at the facility, a total of 1,129 samples were distributed to 21 geoscientists representing 17 institutions and 4 countries.

E-51404

Cooper, A.K., Webb, P.N., **Integrated offshore studies on antarctic Cenozoic history, glaciation, and sea-level change: the ANTOSTRAT project**, *Antarctic journal of the United States*, 1992, 27(5), p.343-346, 15 refs.

The Antarctic Offshore Acoustic Stratigraphy project (ANTOSTRAT) is a recent international cooperative effort to coordinate and integrate all existing acoustic and geologic sample data from the antarctic continental margin to study Cenozoic glacial history and the offshore geologic impacts of the antarctic ice sheet. Five segments of the antarctic continental margin that have thick glacial sedimentary deposits (Ross Sea, Wilkes Land, Prydz Bay, Weddell Sea, and Antarctic Peninsula) have been targeted for detailed studies of existing seismic and geologic data by regional working groups. The aim of the ANTOSTRAT studies is a unified model for circumantarctic glaciation and global sea-level changes. The model would be the basis for future testing by scientific drilling of the antarctic continental margin.

E-51410

Sastry, H.R.S., **Seismic studies on antarctic ice shelf and visco-elastic properties of ice**, International Symposium on Snow and Related Manifestations, Manali, India, Sep. 26-28, 1994. Extended abstracts, Manali, India, Snow and Avalanche Study Establishment, 1994, p.321-326, 3 refs.

Seismic explosion studies were carried out on the antarctic ice shelf near Indian Base Camp during the second Indian expedition to Antarctica. Seismic refraction techniques were employed to obtain stratigraphic features of some bottom layers. The results are presented with a qualitative explanation of unaccounted arrivals through some viscoelastic studies on ice. The limited and exploratory seismic studies carried out on the antarctic ice shelf indicate the presence of a layer of granite rock below the ice and sedimentary layers, conforming to the concept of a continental crust which includes the antarctic shelf. (Auth. mod.)

E-51423

Cantrill, D.J., Drinnan, A.N., **Late Triassic megaspores from the Amery Group, Prince Charles Mountains, East Antarctica**, *Alcheringa*, 1994, 18(1-2), p.71-78, 25 refs.

Megaspores referable to the genera *Caboehonicus* Batten & Ferguson 1987 and *Minerisporites* Potonié 1956 are a common component of the paleoflora recovered from the Jetty Member within the Flagstone Bench Formation of the Amery Group. The known ranges of these two genera, in conjunction with the macrofloral remains, suggest a Late Triassic age. Two new species, *Caboehonicus sinuosus* and *Minerisporites triangulatus*, are described. Scanning electron microscopic examination of the spores indicates that standard palynological treatment of megaspores can result in sculptural degradation, possibly leading to incorrect generic assignment. (Auth.)

E-51438

Macario, A., et al, **Flow line variations in abyssal hill morphology for the Pacific-Antarctic Ridge at 65S**, *Journal of geophysical research*, Sep. 10, 1994, 99(B9), p.17,921-17,934, Refs. p.17,933-17,934.

The authors present the results of a statistical study on the morphological characteristics of abyssal hills recently mapped along two adjacent segments of the Pacific-Antarctic Ridge at 65S. The studied area is a densely surveyed corridor (60 km wide by 600 km long) which is centered on the Pitman Fracture Zone (PFZ) and extends to 12 Ma crust on both sides of the ridge. Abyssal hill size parameters (RMS height H and characteristic width λ) are estimated using Hydrosweep multi-beam data. Variations in abyssal hill characteristics are compared with spreading rate history and crustal structure (as inferred from the mantle Bouguer gravity) in order to indirectly quantify the evolution of this ridge crest system. The magnetic data show abrupt acceleration in spreading rate from 36 to 63 mm/yr (full rate) at Chron 3a (5.7-6.4 Ma). Results indicate a statistically significant negative correlation between abyssal hill size parameters and full spreading rates. Abyssal hills formed during the slower spreading period (ages >8 Ma; full rates 36-44 mm/yr) are 31-86% taller and 21->100% wider than hills created during the faster spreading interval (ages < Ma; full rates 52-63 mm/yr). The well-resolved positive correlation between H and λ is interpreted as an indication of temporal changes in the flexural rigidity of the lithosphere near the vicinity of the ridge crest and, by implication, axial thermal structure. However, one cannot rule out that such a positive trend is due to constructional volcanism. (Auth. mod.)

E-51443

Baumiller, T.K., Gaździcki, A., **Crinoids from the lower part of the La Meseta Formation (Eocene)**, Antarctica, Polar Symposium, 21st, Warsaw, Poland, Sep. 23-24, 1994. Proceedings. Sixty years of Polish research of Spitsbergen, edited by S.M. Zalewski, Warsaw, Institute of Geophysics of the Polish Academy of Sciences, 1994, p.9-13, 11 refs.

The rich fossil record of Paleozoic and Mesozoic crinoids is not matched by the record of their Cenozoic descendants. Much of this may be due to a real decrease in diversity and abundance, but other factors such as differences in preservability and/or habitat may also be responsible. The poor record of the most diverse group of extant crinoids, the comatulids, may result in part from their being taphonomically less resistant than the dominant Paleozoic and Mesozoic groups and/or their predominantly occupying reef habitats. Similarly, the restriction of stalked crinoids to deeper water during the Cenozoic could be responsible for the low number of isocrinid fossils. Thus any new discoveries of Cenozoic crinoid fossils are of great value, not only for increasing the sparse record of this group, but also for helping resolve the timing of biogeographic, ecological, and phylogenetic events. Here the authors report on specimens representing 3 of the 5 extant orders: the isocrinids, cyrtocrinids, and comatulids retrieved from the lower part of the La Meseta Formation on Seymour I.

E-51444

Hara, U., **Bryozoan assemblage from the Lower Miocene Cape Melville Formation of King George Island, West Antarctica**, Polar Symposium, 21st, Warsaw, Poland, Sep. 23-24, 1994. Proceedings. Sixty years of Polish research of Spitsbergen, edited by S.M. Zalewski, Warsaw, Institute of Geophysics of the Polish Academy of Sciences, 1994, p.31-32, 10 refs.

The bryozoan fauna of anascan Cheilostomata which is represented by two genera, *Cellaria* and *Aspidostoma*, was collected from the uppermost part of the Lower Miocene fossiliferous glacio-marine sediments of the Cape Melville Formation at Cape Melville on King George I. Features of their morphology and distribution are discussed.

E-51445

Tambussi, C., et al, **First occurrence of ratite bird in the Paleogene of Antarctica**, Polar Symposium, 21st, Warsaw, Poland, Sep. 23-24, 1994. Proceedings. Sixty years of Polish research of Spitsbergen, edited by S.M. Zalewski, Warsaw, Institute of Geophysics of the Polish Academy of Sciences, 1994,

p.45-48, 7 refs.

Recent field work during the joint Argentine-Polish Field Party (summer of 1993-94) on Seymour I. yielded a fossil bird bone from Tertiary sediments of the La Meseta Formation assignable to ratites (Palaeognathae); this represents the first record of this group of flightless birds from Antarctica. The discovery reported here strongly supports the notion that West Antarctica was used as an antarctic dispersal route by obligate terrestrial forms of ratites during the Mesozoic and early Paleogene, thus connecting different Gondwanian fragments.

E-51451

Smellie, J.L., Hole, M.J., Nell, P.A.R., **Late Miocene valley-confined subglacial volcanism in northern Alexander Island, Antarctic Peninsula**, *Bulletin of volcanology*, 1993, Vol.55, p.273-288, Refs. p.287-288.

Isolated Late Miocene volcanogenic sequences in northern Alexander I. form an unusual cogenetic association of volcanoclastic sandy-gravelly lithofacies (including tillites) and volcanic (lava/hyaloclastite) lithofacies. From simple lithofacies analysis and theoretical considerations of hydrodynamic effects of subglacial eruptions, valley-confined volcanic activity beneath thin wet-based ice is suggested. The Alexander I. successions are complete enough to be regarded as model sequences for this uncommonly recorded type of eruptive/depositional activity. The sedimentary lithofacies represent resedimented tuffs and meltout or flow tills, which were probably deposited in subglacial ice tunnels eroded or enlarged by volcanically heated meltwater. The volcanic lithofacies formed by the interaction of hot magma with the ice tunnel walls (generating abundant meltwater) and water-saturated sediments, resulting in the formation of heterogeneous masses of lava and hyaloclastite. There is no obvious sequence organization in the sedimentary sections. This is probably due to a complex interplay of eruption-related and environmental hydrodynamic factors affecting the relative proportions of water and entrained sediment. (Auth.)

E-51461

Palmer, K., **XRF analyses of granitoids and associated rocks, St. Johns Range, South Victoria Land, Antarctica**, *Victoria University of Wellington. Antarctic data series*, 1990, No.15, 23p., 6 refs.

This report presents analytical data on rocks collected whilst granitoid studies were undertaken in the St. Johns Range (South Victoria Land) by event K043 (Basement Studies). It represents a more detailed follow-up of the regional compilation of granitoid analyses by Palmer (1987). This project took place during Jan. 1986 under the auspices of Victoria University of Wellington Antarctic Expedition 30.

E-51462

Stüwe, K., Oliver, R., **Geological history of Adélie Land and King George V Land, Antarctica: evidence for a polycyclic metamorphic evolution**, *Precambrian research*, 1989, 43(4), p.317-334, 24 refs.

Metamorphic and structural studies in Adélie Coast and George V Coast show that this part of the East Antarctic Shield can be divided into 4 different sections. The areas east of Commonwealth Bay show evidence of polycyclic metamorphic evolution in which low-pressure granulite facies M_1 fabrics are overprinted by retrograde hydrated decompression textures of amphibolite facies during M_2 and by late high-pressure, low-temperature coronas during M_3 . The regional structure and relative timing of events in the other 3 areas is consistent with the recognition of these three metamorphic events. The areas west of Commonwealth Bay underwent low-pressure granulite facies metamorphism during M_1 , decompression during M_2 but no late M_3 overprint. The variation of the grade of M_3 in the different areas from granulite facies pressures east of Commonwealth Bay to no effect west of Cape Hunter is interpreted as a consequence of differential uplift along shear zones with a north-south strike, which exposed successively deeper levels towards North Victoria Land to the east. This spatial association and the age of M_3 suggest that there is a connection between M_3 in George V Coast and Adélie Coast and the Ross orogeny in North Victoria Land. The recognition of 3 metamorphic events can be correlated with three radiometric ages previously established for the Cape Denison orthogneiss. (Auth. mod.)

E-51463

Grew, E.S., Manton, W.I., James, P.R., **U-Pb data on granulite facies rocks from Fold Island, Kemp Coast, East Antarctica**, *Precambrian research*, 1988, Vol.42, p.63-75, Refs. p.74-75.

The northern tip of Fold I. is composed largely of quartzofeldspathic gneisses (charnockitic and enderbitic) and pyroxene granulite. Garnet-biotite-sillimanite gneiss, garnet-clinopyroxene-plagioclase-calc-silicate rock, magnetite-bearing rocks, and ultramafic rocks are very subordinate. The gneisses were deformed by two phases of isoclinal folding and were subsequently intruded by mafic dikes. A second stage of deformation involving tight ductile folding post-dates the dikes. This deformation culminated with the emplacement of hypersthene-bearing pegmatites in discordant planar veins and irregular masses, and with the hornblende-granulite facies metamorphism that resulted in the present-day mineral assemblages. U-Pb isotope data on zircon and monazite from two pegmatites define a chord intersecting concordia at 0.94 \pm 0.08 Ga and 0.21 \pm 0.21 Ga. Results suggest that the gneiss zircons are xenocrysts and do not provide any direct indication of the age of the host gneisses. The Fold I. gneisses are interpreted to be older (Napier Complex?) rocks that were reworked during the Late Proterozoic (ca. 1000 Ma) Rayner event. A similar sequence of events has been reported for a coastal portion of the Eastern Ghats Province of South India, suggesting that these two areas were part of the same metamorphic complex in Gondwana. (Auth. mod.)

E-51464

Sheraton, J.W., Black, L.P., McCulloch, M.T., **Regional geochemical and isotopic characteristics of high-grade metamorphics of the Prydz Bay area: the extent of Proterozoic reworking of Archaean continental crust in East Antarctica**, *Precambrian research*, 1984, Vol.26, p.169-198, Refs. p.194-198.

Preliminary isotopic data for Late Proterozoic (1100 Ma) granulite-facies metamorphics of the Prydz Bay coast indicate only very minor reworking of Archaean continental crustal rocks. Only two orthopyroxene-quartz-feldspar gneisses from the Rauer Group of islands, immediately adjacent to the Archaean Vestfold Block, show evidence for an Early Archaean origin (3700-3800 Ma), whereas the vast majority of samples have Middle Proterozoic crustal formation ages (1600-1800 Ma). The Prydz Bay rocks consist largely of garnet-bearing felsic gneisses and interlayered aluminous metasediments, although orthopyroxene-bearing gneisses are common in the Rauer Group; in contrast, Vestfold Block gneisses are predominantly orthopyroxene-bearing orthogneisses. The extensive Prydz Bay metasediments may have been derived by erosion of Middle Proterozoic rocks, such as the predominantly orthogneiss terrain of the Rauer Group, and deposited not long before the Late Proterozoic metamorphism. Data from nearby parts of the East Antarctic shield also suggest only limited Proterozoic reworking of the margins of the Archaean cratons. As in the Prydz Bay area, high-grade metamorphics in nearby parts of the East Antarctic shield show a secular increase in the sedimentary component. (Auth. mod.)

E-51468

Galtier, J., Taylor, T.N., **First record of ferns from the Permian of Antarctica**, *Review of palaeobotany and palynology*, 1994, Vol.83, p.227-239, 21 refs.

Filiclean ferns are described for the first time from Antarctic silicified permineralizations of Permian age. *Skaaripteris* gen. nov. had small creeping stems, 1-3 mm in diameter, characterized by a mesarch protostele with a prominent outer ring of large tracheids. Stems branched dichotomously. Oval leaf traces were produced at widely spaced intervals without a leaf gap due to the previous closure of the outer large tracheid layer in the stele. The petiole trace is *omega*-shaped with adaxial protoxylem. Sporangia, each with a prominent lateral annulus and short pedicel, were borne on ultimate non-laminate frond divisions. The possibility that the stem was subaquatic is discussed. The unique combination of characters suggests that this plant may be interpreted at an intermediate evolutionary level between Carboniferous filiclean ferns and certain modern families. (Auth.)

E-51548

Barale, G., Philippe, M., Torres, T., Covacevich, V., **Triassic flo-**

ras from Williams Point, Livingston Island (South Shetland, northern Antarctica), *Académie des sciences, Paris. Comptes rendus. Série II*, July 7, 1994, 319(1), p.141-147, With French summary. 10 refs.

Fossil plants collected in the northern part of Williams Point (Livingston I.) have revealed two different floras. The systematic composition indicates an Upper Triassic age. The autochthony of the plants is asserted and makes it necessary to revise the paleogeography of this region at the end of the Triassic. (Auth.)

E-51578

Melles, M., Kulbe, T., Overduin, V.V., Verkulich, S., **Expedition Bunger Oasis 1993/94 of the AWI research unit Potsdam**, *Berichte zur Polarforschung*, 1994, No.148, p.27-80, 40 refs.

The field work in Bunger Oasis was part of a bilateral research project, now running for about 3 years, with the Arctic and Antarctic Research Institute (AARI), St. Petersburg. The objective of the project is a contribution to the understanding of the late Quaternary environmental history of East Antarctica. For this purpose different natural data archives of the palaeoenvironmental conditions, such as marine and lacustrine sediments, other terrestrial deposits, water bodies, and ice masses, will be sampled and investigated in four ice-free coastal areas (oases) of East Antarctica, namely: (1) Schirmacher Oasis, (2) Untersee Oasis, (3) Bunger Oasis, and (4) Jetty Oasis. The expedition to Bunger Oasis, Wilkes Land, during the 1993-94 summer season was the second within the scope of the bilateral project. The first joint expedition was carried out in the Schirmacher and Untersee Oases, Queen Maud Land, in 1991-92; the sample and datum sets from these areas will be completed in 1994-95. An expedition to Jetty Oasis, Mac. Robertson Land, will be undertaken within the next five years. (Auth.)

E-51583

Caprioli, R., Falchi, G., Gragnani, R., Torcini, S., **Variation of major trace elements in some lakes at Terra Nova Bay (Antarctica): December 1990-February 1991**, Casaccia (Italy), Ente per l'Nuove Tecnologie l'Energia e l'Ambiente, 1993, 22p., DE94775295, 11 refs.

The chemical composition data on lake waters sampled in the area of Edmonson Point, Carezza, Inexpressible I., Andersson Ridge and Tarn Flat are presented and discussed. The averages of total dissolved solids (TDS) of each lake range from 95 mg/l to 3765 mg/l. The chemical composition is characterized by high contents of Na and Cl. During the sampling period, the salinity showed constant or increasing values. The processes that condition this behavior are examined and discussed. In general, the concentration of trace elements does not reveal any significant trend over time, and only the nickel content in the lakes changes with increase in salinity. (Auth.)

E-51607

Cione, A.L., Reguero, M., **New records of the sharks *Isurus* and *Hexanchus* from the Eocene of Seymour Island, Antarctica**, *Geologists' Association. Proceedings*, Feb. 1994, 105(1), p.1-14, Refs. p.12-14.

Most of the information about the Tertiary ichthyofauna in the periantarctic ocean comes from Seymour I., close to the tip of the Antarctic Peninsula. The authors present here new records which improve the knowledge of the ancient high latitude biotas and allow a better understanding of the origin of the Recent local marine fauna. In this paper, sharks' teeth of *Isurus praecursor* and an indeterminate species of *Hexanchus* are reported from the Eocene of Seymour I. They come from an assemblage with a predominance of *Carcharias macrotia*, *Squantina* sp., *Pristiophorus* sp., and *Myliobatis* sp. (Auth.)

E-51608

Hand, M., et al, **Metapelitic granulites from Jetty Peninsula, East Antarctica: formation during a single event or by polymetamorphism?**, *Journal of metamorphic geology*, July 1994, 12(4), p.557-573, Refs. p.572-573.

Granulite facies metasedimentary gneiss exposed on Jetty Peninsula contains assemblages involving garnet-sillimanite-biotite-cordierite-spinel-ilmenite-rutile and garnet-ortho-pyroxene-cordierite-biotite, as

well as quartz and K-feldspar. Average pressure calculations indicate peak pressures of 5.9 +/- 0.4 kbar at 700 C for the cordierite-bearing D2 assemblages. Available radiometric data suggest that peak metamorphism occurred at ca. 1000 Ma and D2 occurred after 940 +/- 20 Ma. The following two possibilities exist for the metamorphic evolution: the formation of the lower pressure cordierite-bearing assemblages is associated with a separate metamorphic event (M2) unrelated to the peak assemblage (M1), and the lower pressure assemblages have no relevance in terms of a single tectonothermal event; or the cordierite-bearing assemblages formed during a progression from peak conditions. In this case, the lower pressure assemblages reflect a broadly decompressional metamorphic evolution during which temperatures fluctuated. Comparison with *P-T* paths from granulites of similar age in adjacent areas suggests that the second possibility should be preferred. (Auth. mod.)

E-51609

Fitzsimons, I.C.W., Harley, S.L., **Garnet coronas in scapolite-wollastonite calc-silicates from East Antarctica: the application and limitations of activity-corrected grids**, *Journal of metamorphic geology*, Nov. 1994, 12(6), p.761-777, Refs. p.775-777.

Calc-silicate boudins within Proterozoic granulite facies gneisses of the northern Prince Charles Mountains preserve a number of reaction textures including garnet coronas between calcite and scapolite; garnet-quartz coronas between scapolite and wollastonite and between plagioclase and wollastonite; calcite-quartz intergrowths in wollastonite; and calcite-plagioclase symplectites in scapolite. These textures have been modelled using petrogenetic grids for reactions in the CaO-Al₂O₃-SiO₂-CO₂ system, but with reduced mineral activities to account for additional components in real mineral compositions. In this case, mineral compositions close to end-member values and low extents of reaction progress mean that compositional change was limited and the grids are good approximations to true pseudosections over the entire *P-T-a*(sub co₂) range of interest. The grids show that the textures are consistent with near-isobaric cooling from about 850 to 700 C at 7 kbar, a *P-T* path compatible with thermobarometric studies of other lithologies from the area. (Auth. mod.)

E-51610

White, R.W., Clarke, G.L., **Garnet-forming reactions and recrystallization in high-grade mylonite zones, Mac. Robertson Land, East Antarctica**, *Journal of metamorphic geology*, Nov. 1994, 12(6), p.853-865, Refs. p.864-865.

Proterozoic granulite facies gneisses in Mac. Robertson Land are cut by numerous D5 mylonite-ultramylonite zones of probable Cambrian age. In garnet-absent mafic two-pyroxene gneisses and garnet-bearing charnockitic orthogneisses, the mylonite-ultramylonite zones are characterized by the growth of garnet at the expense of ilmenite, pyroxene and plagioclase. Textures within each mylonite zone can vary from protomylonitic to ultramylonitic. A range of mineral textures involving M5 garnet is developed corresponding to variations in deformation intensity. In protomylonites, garnet occurs as coronas on orthopyroxene-plagioclase and ilmenite-plagioclase boundaries, and as overgrowths on earlier garnet. In ultramylonites, fine-grained orthopyroxene-plagioclase-garnet +/- quartz +/- clinopyroxene intergrowths and poikilitic garnet are common. Garnet growth in all shear zones is accompanied by shifts in the compositions of neoblastic minerals occurring with garnet, consistent with local chemical equilibrium having been attained during recrystallization. Mylonitization is inferred to have occurred at *P* of about 6.5 kbar. Temperature estimates for M5 vary between 550 and 797 C, which may reflect variations and uncertainties associated with the calibrations used and/or partial re-equilibration during cooling. (Auth. mod.)

E-51621

Burgess, J.S., Spate, A.P., Shevlin, J., **Onset of deglaciation in the Larsemann Hills, eastern Antarctica**, *Antarctic science*, Dec. 1994, 6(4), p.491-495, 20 refs.

Larsemann Hills is an ice-free area of over 150 lakes that are not ice-covered in summer. Despite being located at 69.5S, the area is not characterized to any extent by expected glacial indicators such as till, moraine or striations. Although the lakes show signs of evaporative lowering of water levels, evolution to a saline state has not advanced to any

great degree. While some evidence has suggested only recent deglaciation (less than 10,000 BP) and large accumulations of ice (200-500 m), it is now suggested that the area has not been glaciated during the Wisconsin to the extent previously claimed. The paper reports moss deposits aged 24,950 BP that are significantly older than those previously reported for the area. (Auth.)

E-51623

Guy-Ohlson, D., Linström, S., **Palaeoecology of the Early Permian strata at Heimefrontfjella, Dronning Maud Land, Antarctica**, *Antarctic science*, Dec. 1994, 6(4), p.507-515, 29 refs.

Palaeopalynological studies form an integral part of the geological investigation of the Late Paleozoic sedimentary history of Queen Maud Land. During an examination of organic residues prepared from different localities in the Heimefront Range, the freshwater green alga *Botryococcus* was found. Exceptionally well-preserved colonies of *Botryococcus* were recorded in several samples at two sections of Early Permian age, Lidkvaret and Locality A. These colonies vary in form and stage of development. By analogy with observations on recent material, the following palaeoecological conclusions are drawn: varying environmental and climatic conditions over a length of time existed at Lidkvaret, and very short ephemeral aquatic conditions existed intermittently at Locality A. (Auth.)

E-51624

Pirrie, D., **Petrography and provenance of the Marambio Group, Vega Island, Antarctica**, *Antarctic science*, Dec. 1994, 6(4), p.517-527, Refs. p.526-527.

Late Cretaceous sedimentary rocks assigned to the Santa Marta (Herbert Sound Member) and López de Bertodano (Cape Lamb and Sandwich Bluff members) formations of the Marambio Group crop out on Cape Lamb, Vega I. Although previous studies have recognized that these sedimentary rocks were derived from the northern Antarctic Peninsula region, the work presented here allows the provenance and palaeogeographical evolution of the region to be described in detail. On the basis of both sandstone petrography and clay mineralogy, the Herbert Sound and Cape Lamb members reflect sediment input from a low relief source area, with sand grade sediment sourced from grade metasediments, and clay grade sediment ultimately derived from the weathering of an andesitic source area. In contrast, the Sandwich Bluff Member reflects a switch to a predominantly andesitic volcanoclastic source. However, this sediment was largely derived from older volcanic suites due to renewed source area uplift, with only a minor component from coeval volcanism. Regional uplift of both the arc terrane and the western margin of the James Ross Basin was likely during the Maastrichtian. (Auth.)

E-51652

Marshall, J.E.A., **Falkland Islands and the early fragmentation of Gondwana: implications for hydrocarbon exploration in the Falkland Plateau**, *Marine and petroleum geology*, Oct. 1994, 11(5), p.631-636, 35 refs.

During the early breakup of Gondwana, the Falkland Platform became detached from southern Africa as a separate microplate. At this time the Falkland Plateau Basin developed between the Falkland Platform and the Maurice Ewing Bank. Significant extension occurred within this basin with accompanying high heat flow. This heat flow will have thermally overmatured any Late Jurassic to Mid-Cretaceous source rocks present within the basin while still beneath a thin sedimentary cover. Such early overmaturation is confirmed by anomalously high thermal maturity levels and vitrinite reflectivity gradients from DSDP (Deep Sea Drilling Project) sites on the Maurice Ewing Bank. It is envisaged that only restricted hydrocarbon source potential remained for subsequent generation during later Cretaceous and Tertiary burial. Source rock analysis of the Permian Black Rock Member (Port Sussex Formation) in East Falkland shows it to have once had significant hydrocarbon generating potential, although now destroyed by metamorphism. Some potential may still remain in southernmost East Falkland. In contrast, thermal maturities in West Falkland are still within the oil window such that these Permian shales remain a viable source rock.

E-51653

Mikhailov, V.M., Mikhal'skiĭ, E.V., Beliatskiĭ, B.V., Semenov, V.S., **Layered intrusion of gabbro pluton in the central part of the Prince Charles Mountains (East Antarctica)** [Rassloennaia intruziia gabbroidov v tsentral'noi chasti gor Prins-Charl'z (Vostochnaia Antarktida)], *Akademiia nauk. Doklady*, Dec. 1991, 321(5), p.1066-1070, In Russian. 3 refs.

The presence of late Proterozoic intrusion of gabbroids in the central part of the Prince Charles Mountains attests to the long stability of this region. The development of the intrusion seems to date back to the earliest stage in the region of riftogenic activation of ancient cratonization centers. Studies show that formation of the intrusion in connection with tectonic-magmatic processes in neighboring active zones also seems probable. (Auth. mod.)

See also:

A-49932 A-50288 A-51117 B-49502 B-49565
B-49692 B-49712 B-49722 B-49764 B-49858 B-49933
B-49943 B-50100 B-50147 B-50257 B-50258 B-50259
B-50550 B-50706 B-50964 B-50969 B-50985
B-51400 B-51428 C-51192 C-51403 F-49589 F-49700
F-49703 F-49811 F-50014 F-50199 F-50205 F-50227
F-50719 F-51272 F-51316 F-51491 F-51622 G-50607
I-50953 I-51225 J-49560 J-49609 J-49679 J-49708
J-49882 J-50057 J-50112 J-50121 J-50122 J-50124
J-50129 J-50408 J-50847 J-51289 J-51457 J-51549
J-51586 L-49650 L-49669 L-49835 L-49860 L-49863
L-49902 L-49934 L-49948 L-50026 L-50114 L-50176
L-50265 L-50627 L-50671 L-50806 L-50807
L-50808 L-50809 L-51268 L-51279 L-51435
L-51436 L-51577 L-51585 M-51115

F. ICE & SNOW

F-49510

Goldstein, R.M., Engelhardt, H., Kamb, B., Frolich, R.M., **Satellite radar interferometry for monitoring ice sheet motion: Application to an antarctic ice stream**, *Science*, Dec. 3, 1993, 262(5139), p.1525-1530, 42 refs.

Satellite radar interferometry (SRI) provides a sensitive means of monitoring the flow velocities and grounding-line positions of ice streams, which are indicators of response of the ice sheets to climatic change or internal instability. The detection limit is about 1.5 mm for vertical motions and about 4 mm for horizontal motions in the radar beam direction. The grounding line, detected by tidal motions where the ice goes afloat, can be mapped at a resolution of about 0.5 km. The SRI velocities and grounding line of the Rutford Ice Stream agree fairly well with earlier ground-based data. The combined use of SRI and other satellite methods is expected to provide data that will enhance the understanding of ice stream mechanics and help make possible the prediction of ice sheet behavior. (Auth.)

F-49527

Vaughan, D.G., **Implications of the break-up of Wordie Ice Shelf, Antarctica for sea level**, *Antarctic science*, Dec. 1993, 5(4), p.403-408, 27 refs.

Temperature records in the Antarctic Peninsula have shown a climatic warming of 1.5 C over the past 30 years and a number of ice shelves have retreated. The most dramatic retreat has been that of Wordie Ice Shelf, which has undergone a catastrophic disintegration since the 1960s. Understanding the cause and mechanism of the breakup may provide important clues to the fate of ice shelves farther south which, it has been suggested, help to stabilize the West Antarctic Ice Sheet. The breakup of Wordie Ice Shelf has been analyzed using Landsat and SPOT imagery. These observations show that the relative contribution of the various input glaciers to the grounding line flux has not altered during the breakup. This means that the effect of the rapid and almost complete removal of the ice shelf has not been transmitted upstream and is not causing a rapid increase in velocities of the input glaciers. The volume of grounded ice in the catchment of Wordie Ice Shelf will thus be largely unaffected by the breakup and there will be no significant contribution to sea level change. Since other ice shelves around the Antarctic Peninsula are also fed by relatively steep mountain glaciers, the effect of the loss of the ice shelves on sea level would be likely to be similarly small. (Auth.)

F-49530

International Geoscience and Remote Sensing Symposium, 13th, Tokyo, Japan, Aug. 18-21, 1993, **IGARSS '93. Better understanding of earth environment**, New York, Institute of Electrical and Electronics Engineers, 1993, 2160p. (4 vols.), Refs. passim. For selected papers see 48-1679 through 48-1730, or F-49531 through F-49535.

This is a collection of some 600 papers in 4 volumes, mostly on satellite radar observations of the Earth and its atmosphere, presented at the 13th International Geoscience and Remote Sensing Symposium, Tokyo, Japan, Aug. 18-21, 1993. About 50 papers deal with observations of sea ice, ice sheets, and snow, and of those, 5 are pertinent to Antarctica. The papers on Antarctica discuss estimating the accumulation rates of snow on antarctic ice sheets from passive microwave and radar altimeter data; C-band microwave backscatter of sea ice in the Weddell Sea; sea ice regimes from satellite multichannel passive microwave data; backscattering from snow covers on sea ice; and the effect of subsurface scattering on the accuracy of ice sheet altimeter retracking algorithms.

F-49531

Davis, C.H., **Synthesis of passive microwave and radar altimeter data for estimating accumulation rates of polar snow**, International Geoscience and Remote Sensing Symposium, 13th,

Tokyo, Japan, Aug. 18-21, 1993. IGARSS '93. Better understanding of earth environment. Vol.1, New York, Institute of Electrical and Electronics Engineers, 1993, p.334-337, 9 refs.

Dry-snow extinction coefficients derived from radar altimeter data are compared with brightness temperature data from passive microwave measurements over a portion of the East Antarctic plateau. The comparison between the extinction coefficients and the brightness temperatures shows a strong negative correlation, where the correlation coefficients ranged from -0.87 to -0.95. The extinction coefficient of the dry polar snow decreases with increasing surface elevation, while the average brightness temperature increases with surface elevation. The analysis shows that the observed trends are related to geographic variations in scattering coefficient of snow, which in turn are controlled by variations in surface temperature and snow accumulation rate. By combining information present in the extinction coefficient and brightness temperature datasets, a model is developed that can be used to obtain quantitative estimates of the accumulation rate of dry polar snow. (Auth. mod.)

F-49532

Drinkwater, M.R., Hosseinmostafa, A.R., Dierking, W., **C-band microwave backscatter of sea ice in the Weddell Sea during the winter of 1992**, International Geoscience and Remote Sensing Symposium, 13th, Tokyo, Japan, Aug. 18-21, 1993. IGARSS '93. Better understanding of earth environment. Vol.2, New York, Institute of Electrical and Electronics Engineers, 1993, p.446-448, 9 refs.

A C-band radar was used to record the backscatter of Weddell Sea ice in the winter of 1992. These shipborne microwave signatures are the first of their kind. Calibrated hh and vv-pol signatures were recorded for several ice types as the icebreaker crossed the Weddell Sea. At each site, measurements were made of snow and sea ice characteristics. Meteorological information, radiation budget and oceanographic data were also recorded. A first-year ice result is presented with relation to sea ice physical properties. *In-situ* data are used in predictions from a theoretical model and the results compared with backscattering values. The primary scattering contributions under cold winter conditions come from the air/snow and snow/ice interfaces. Time-series data indicate that C-band is sensitive to snow and ice physical changes as a result of climatic and oceanographic forcing. (Auth.)

F-49533

Comiso, J.C., **Ice regimes in the Antarctic and Arctic using satellite multichannel passive microwave data**, International Geoscience and Remote Sensing Symposium, 13th, Tokyo, Japan, Aug. 18-21, 1993. IGARSS '93. Better understanding of earth environment. Vol.2, New York, Institute of Electrical and Electronics Engineers, 1993, p.843-846, 10 refs.

Monthly and weekly brightness temperature data from the various SSMI (Special Sensor Microwave Imager) channels, especially the 85 GHz channel, show the existence of ice covered areas associated with persistent brightness temperatures. The physical characteristics of the ice cover in each of these areas are studied for possible association with different regimes of sea ice cover. In general, the ice cover can be divided into different ice regimes that are associated with extensive new ice formation, young ice regions, first year ice areas with or without thick snow cover, and a few types of multiyear ice areas. Unsupervised identification of the regimes is done with multichannel cluster analysis. The interpretation of the different regimes is based mainly on extensive field measurements, radiative transfer calculations, comparisons with other satellite data, and time series development of the surface ice cover from early fall through winter. The key to proper identification of part of this region is the use of the 85 GHz data, which is the most sensitive to surface effects among the SSM/I channels. (Auth.)

F-49534

Tjuatja, S., et al, **Analysis of backscattering from snow covers on arctic and antarctic sea ice**, International Geoscience and Remote Sensing Symposium, 13th, Tokyo, Japan, Aug. 18-21, 1993. IGARSS '93. Better understanding of earth environment. Vol.3, New York, Institute of Electrical and Electronics Engineers, 1993, p.1035-1037, 5 refs.

A multilayer scattering model for snow covered sea ice is used in the analysis of backscattering from snow-covered arctic and antarctic sea ice. The multilayer model accounts for full incoherent interactions inside the snow and sea ice layers. The rough boundaries are modeled using the IEM (integral equation method) surface model. Model computations are carried out using the available ground truth information obtained at the measurement sites. Good agreement between model and data was obtained in both arctic and antarctic cases. Preliminary analysis of the backscattering measurements from an antarctic snow-covered sea ice indicated that the signature is dominated by scattering from the snow-ice interface and attenuation through snow. This is due to the high salinity of the bottom portion of the snow layer and the presence of slush at the snow-ice interface which were indicated in the ground truth information. The backscattering signature of an arctic snow-covered sea ice, on the other hand, consists of contributions from snow-ice interface, the snow layer, and the bubbly ice underneath. The snow cover of arctic sea ice is generally very low in salinity and the average ice particle size in the arctic snow cover is also smaller than that of the antarctic snow cover. At X-band, the backscattering contribution from the arctic snow layer is significant only at large incident angles. (Auth.)

F-49535

Davis, C.H., **Effect of sub-surface volume scattering on the accuracy of ice-sheet altimeter retracking algorithms**, International Geoscience and Remote Sensing Symposium, 13th, Tokyo, Japan, Aug. 18-21, 1993. IGARSS '93. Better understanding of earth environment. Vol.3, New York, Institute of Electrical and Electronics Engineers, 1993, p.1053-1057, 15 refs.

The NASA and ESA retracking algorithms are compared with an algorithm based upon a combined surface and volume (S/V) scattering model. First, the S/V, NASA, and ESA algorithms were used to retrack over 400,000 altimeter return waveforms from the Greenland and antarctic ice sheets. The surface elevations from the S/V algorithm were compared with the elevations produced by the NASA and ESA algorithms to determine the relative accuracy of these algorithms when subsurface volume-scattering occurs. The results show that the NASA algorithm produced surface elevations within 35 to 50 cm of the S/V algorithm, while the performance of the ESA algorithm was slightly worse. Next, by analyzing several thousand satellite crossover points from the antarctic dataset, the author determined the retracking algorithm that produced the most repeatable surface elevations. The elevations derived from the S/V algorithm had the smallest r.m.s. error for the region of the East Antarctic plateau examined here. The ESA algorithm produced erroneous estimates of elevation change when seasonal variations were present; it measured 0.7 to 1.6 m change in elevation over a 6 month period on the East Antarctic plateau where accumulation rates are only 10 cm/year. (Auth.)

F-49537

Jacob, P., Klockow, D., **Measurements of hydrogen peroxide in antarctic ambient air, snow and firn cores**, *Fresenius' journal of analytical chemistry*, 1993, Vol.346, p.429-434, 24 refs.

Primary measurements of H_2O_2 at a coastal antarctic station (Georg von Neumayer) during summer 1989-90 indicated mean gas phase concentrations of 0.4 ppbv. Concentration variations of gaseous H_2O_2 were not significantly related to a diurnal pattern, but to evaporation and recrystallization processes of H_2O_2 in snow and hoarfrost. H_2O_2 concentrations in snow—ranging from 90 to 480 ppbw—decreased after deposition, and no distinct seasonal structure could be found in pit studies and firn core analyses down to 12 m depth. (Auth. mod.)

F-49542

Watanabe, O., ed, NIPR Symposium on Polar Meteorology and Glaciology, 15th, Tokyo, July 8-9, 1992, **Proceedings of the NIPR Symposium on Polar Meteorology and Glaciology**, No.7, Tokyo, National Institute of Polar Research, 1993, 126p.,

Refs. passim. For individual papers see 48-1863 through 48-1868 or C-49546, F-49543 through F-49545, I-49549, J-49547 and J-49548.

This is a collection of papers presented at the 15th Symposium on Polar Meteorology and Glaciology held on July 8-9, 1992, in Tokyo. It consists of 10 full-length papers and 30 abstracts; the former were refereed and are arranged in the order of scientific areas of meteorology, glaciology and physical oceanography.

F-49543

Uchida, T., et al, **Measurements of surface energy of air-hydrate crystals in Vostok ice core, Antarctica**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1993, p.1-6, 8 refs.

Microscopic observations of thin sections of Vostok ice cores show that various shapes and sizes of air-hydrate crystals are located on the grain boundaries. The surface energy of air-hydrate crystal was measured on 41 crystals in 7 different depth ice cores. These measurements revealed that the surface energy of air-hydrate was almost constant at all depths below 1050 m, and that the average ratio between the surface energy of air-hydrate and ice grain boundary energy was 0.97 ± 0.19 . The observations also showed that air-hydrate crystals acted as obstacles for ice grain boundary migration. (Auth.)

F-49544

Uchida, T., et al, **Effects of air-hydrate crystals on ice grain growth**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1993, p.7-13, 10 refs.

Microscopic observations of air-hydrate crystals in Vostok ice cores revealed that air-hydrate crystals acted as obstacles to grain boundary migration. About half of the air-hydrate crystals were observed to be located on the grain boundaries; their volume concentrations were more than 10^3 times larger than dust concentration. The presence of air-hydrate crystals on a grain boundary was considered to reduce effectively the ice grain growth rate. However, air-hydrate crystals did not result in marked changes in grain size associated with climate transitions. (Auth.)

F-49545

Ikeda, T., Uchida, T., Mae, S., **Effect of hydrostatic pressure on the formation of air-hydrate crystals**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1993, p.14-23, 16 refs.

The transformation of air-hydrate crystals from air bubbles in ice was observed by microscope at 270 K under high hydrostatic pressure between 19.6 and 34.3 MPa during a period of 16 days. The number concentration of the air-hydrates formed by the pressurization was measured and was compared with the number concentration of the air bubbles included. It was found that the transformation rates calculated from these number concentrations increased significantly. The transformation process is discussed in terms of the nucleation theory of the crystal. (Auth.)

F-49552

Saunders, A., et al, **Glacial ice cores: a window on the past**, *Arctic circle*, July/Aug. 1990, 1(1), p.57-59.

The importance of ice cores in glaciological research, especially the records obtained in the Vostok core, and the history of ice core drilling are briefly reviewed. A schematic representation of climatic variation over the last 90,000 years, derived from ice core research, is shown and interpreted.

F-49582

Dong, Z.Q., Liang, X.S., **Role of antarctic sea ice, polynyas and glacier ice in formation and modification of the antarctic water masses**, *Antarctic research (Chinese edition)*, 1993, 5(3), p.1-16, In Chinese with English summary. Refs. p.14-15.

From data collected in a 1992-1993 oceanographic survey, the significant effects of sea ice, polynyas and glacier ice on the formation and modification of antarctic water masses are discussed in detail. Results show that the annual change of the antarctic sea ice cover is not significant; the northern limit of the cover in winter varies only a few degrees in latitude

from year to year, while the maximum coverage in summer is no more than twice its minimum. The seasonal change, however, is significant: the average area of sea ice cover in winter is usually more than five times the area in summer. The dynamics and thermodynamics of the sea ice cover are intricately linked with the ocean. In deep areas of the southern ocean, the vertical convection is one of the major factors in the formation of the antarctic bottom water and the antarctic intermediate water. The melting of sea ice in summer results in the formation of antarctic summer surface water. This process, together with supercooling beneath the ice shelves, results in mixing which forms the continental shelf water which, in turn, contributes greatly to the formation of the shelf ice water and the antarctic bottom water.

F-49589

Dai, F.N., et al, **First verification of volcano extrusive in an ice core from Low Dome of Collins Ice Cap, King George Island, Antarctica**, *Antarctic research (Chinese edition)*, 1993, 5(3), p.75-77, In Chinese with English summary. 4 refs.

A systematic investigation and analysis was conducted on the inner structure and exterior morphology of black deposits collected between 40 and 50 m of depth of an ice core from the Low Dome of Collins Ice Cap, King George I. Optical verification under a polarizing microscope showed the black deposit structure to be indicative of volcanic extrusive activity. Morphological aspects indicating extrusive volcanism were revealed by EMP-810Q electronic probe.

F-49600

Han, J.K., et al, **Concentration characteristics of soluble impurities in the surface snow of Collins Ice Cap, King George Island, Antarctica**, *Antarctic research (Chinese edition)*, 1993, 5(2), p.28-33, In Chinese with English summary. 12 refs.

Measurements carried out for the upper 10 m firn/ice core obtained at the main dome of Collins Ice Cap, King George I. revealed the direct association of soluble impurities of snow mass with the composition of atmosphere aerosols over the Collins Ice Cap. The simultaneous variation shown by the concentration profiles of $\text{Na}^+/\text{K}^+/\text{Mg}^{2+}/\text{Ca}^{2+}/\text{SO}_4^{2-}/\text{Cl}^-/\text{Br}^-$, and very approximate EF value (about 1), suggested a common marine source from which they originated before being incorporated into the snow and experiencing a similar deposition process. Besides the possible surface contamination, NH_4^+ varied uniformly along the deeper part of the core in concentration, which could be considered as background value of ammonium. A satisfactory explanation for the NO_3^- concentration profile could not be obtained at present. (Auth.)

F-49604

Xie, S.M., Hao, C.J., Qian, P., Zhang, L., **Preliminary study on the variation features of the antarctic sea ice**, *Antarctic research (Chinese edition)*, 1993, 5(2), p.57-62, In Chinese with English summary. 8 refs.

Based on the antarctic sea ice data from 1973 to 1989 issued by the America Joint Ice Center, the distribution of antarctic sea ice is analyzed, the net sea ice area indexes are calculated, and the distribution pattern and its variations are obtained. Antarctic sea ice is divided into three large regions: Region I is a zonal area which includes the Prydz Bay area; Region II mainly includes the Ross Sea area, and Region III mainly includes the Weddell Sea area. The whole antarctic sea ice area is defined as Region IV. The seasonal changes of the sea ice are obvious. During summer the net sea ice area (not including the area of open water) is about 3,190,000 km^2 ; during winter, the area index is about 16,840,000 km^2 . (Auth. mod.)

F-49632

Davis, C.H., Poznyak, V.I., **Depth of penetration in antarctic firn at 10 GHz**, *IEEE transactions on geoscience and remote sensing*, Sep. 1993, 31(5), p.1107-1111, 33 refs.

Measurements taken by an X-band pulse radar system in East Antarctica in 1987 were analyzed to determine the depth of penetration of radar energy into polar firn. A minimum estimate of the penetration depth at 10 GHz for the cold and dry polar plateau region is approximately 4.7 m. Spatial variations in the amount of signal penetration were observed and are related to latitude, surface elevation, and mean annual temperature.

The amount of signal penetration and its spatial variation are important factors that should be considered when processing datasets from microwave remote sensing systems that operate in the polar regions. (Auth.)

F-49640

Souchez, R., Tison, J.L., **Chemical and isotopic distribution in ice due to water freezing in Antarctica**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.3, Brussels, Belgian Science Policy Office, 1993, 42p., Refs. p.37-42.

The two main factors which influence the isotopic and chemical signals in ice during a water/ice phase change are the freezing rate and the characteristics of the parent water. The isotopic and chemical characteristics of multi-year sea ice sampled in a rift of George VI Ice Shelf can only be understood if changes in parent water properties during the sea ice cover formation are taken into account. The dominating role of parent water effects over freezing rate effects result in sympathetic fluctuations between the two profiles: when ice is enriched in heavy isotopes, it is also enriched in salts and the reverse is equally true even at a small scale. In the case of the rift of George VI Ice Shelf, variable mixing of sea water with melt water from basal shelf ice plays the major role in explaining the distributions. In some circumstances, liquid water is present only in small amounts such as at the base of the ice sheet. Basal ice was encountered in Adélie Coast in a core drilled through the ice sheet margin and in a ramp near the sea. An isotopic and chemical study of this ice reveals the presence of liquid water at crystal boundaries at subfreezing temperatures, and the role of small scale freezing events which explain the main characteristics of basal ice. A new mechanism of basal ice formation is proposed. (Auth. mod.)

F-49643

Huybrechts, P., **Numerical study on the response of the antarctic ice sheet to changes of environmental conditions**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.3, Brussels, Belgian Science Policy Office, 1993, 45p., Refs. p.43-45.

This report summarizes results of a numerical study on the response of the antarctic ice sheet to changes in environmental conditions, both on the longer palaeoclimatic time scale and on the shorter time scale associated with future greenhouse warming. The ice sheet model developed for this is three-dimensional and time-dependent. It incorporates a coupled ice shelf, grounding-line dynamics, basal sliding and isostatic bed adjustment. Ice flow is calculated on a fine mesh (40 km horizontal grid size and 10 layers in the vertical) for grounded and floating ice and a stress transition zone in between, where all stress components contribute in the effective stress of the flow law. The model has full coupling between thermal field and ice flow, and the ice sheet geometry is freely generated in response to changes in sea level, surface temperature and mass balance. A simulation of the present ice sheet reveals that the model is able to yield realistic results. An attempt is then made to simulate the ice sheet through the last glacial-interglacial cycle. The findings support the hypothesis that the antarctic ice sheet basically follows glacial episodes in the Northern Hemisphere by means of sea-level teleconnections. On the shorter greenhouse warming time scale, the model's response is determined by changes in the mass balance. It is found that as long as the temperature rise is below 5 C, the antarctic ice sheet is likely to grow, because melting at the ice sheet edge can still be offset by higher deposition rates on the plateau. These model results do not support the hypothesis of a catastrophic collapse of the West Antarctic ice sheet, not even when a uniform melting rate of 1 m/yr is imposed below the ice shelves. (Auth. mod.)

F-49644

Pattyn, F., Decleir, H., Huybrechts, P., **Ice dynamical studies in the Sør Rondane Mountains, Dronning Maud Land, East Antarctica**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.3, Brussels, Belgian Science Policy Office, 1993, 35p., Refs. p.32-35.

A quantitative and qualitative picture of the glacier characteristics and subglacial relief of the central part of the Sør Rondane area, Queen Maud Land is presented. The quantitative data are then used in a model to simu-

late both present and past glacier behavior. For this purpose the authors describe first the mass balance and temperature regime of the area as a function of elevation. On the basis of movement stakes, surveyed during two consecutive seasons, the velocity field and dynamical aspects of Jenningsbreen could be determined. It was shown how this glacier is in the process of being cut off from the main ice supply. The results are presented as maps of subglacial relief, revealing the central part of the Sør Rondane as an ice covered fjord landscape. The characteristic U-shaped valley cross-profiles originated by widening and deepening of an inherited coastal mountain fluvial drainage pattern. A flow line model was then developed to simulate the behavior of the outlet glaciers of the Sør Rondane. The nearly stagnant character of Jenningsbreen was confirmed. It is shown how the present ablational character of the Sør Rondane is in equilibrium with the glacier dynamics. A significantly greater ablation is required to produce deglaciation in this area. The simulation of the Last Glacial Maximum shows a very modest increase in elevation and advancement of the ice sheet. (Auth. mod.)

F-49645

Petit, B., Demuth, C., **Sea ice and circulation in the Weddell Sea**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.3, Brussels, Belgian Science Policy Office, 1993, 48p., 18 refs.

The model of sea ice formation developed during the first phase of the Belgian scientific research program on Antarctica is the basis of the present work. The thermodynamic features have been completely checked to improve the behavior of the mixed layer. The improvement of ice motion has been studied by developing circulation models. First, a 2.5D vertical plane model is applied in antarctic conditions to point out the problems encountered in the southern ocean. This model is then extended in the third direction of space to obtain a 3D oceanic model. This three-dimensional model is used to compute the currents in the Weddell Sea for each month in a year. It reproduces the clockwise circulation of the Weddell Sea and the strong northeast currents in the northern Drake Passage. These results are then introduced in the SEAICE model to calculate the ice dynamics. They yield satisfactory ice thicknesses and ice extent. (Auth.)

F-49661

De Veaux, R.D., Gordon, A.L., Comiso, J.C., Bacherer, N.E., **Modeling of topographic effects on antarctic sea ice using multivariate adaptive regression splines**, *Journal of geophysical research*, Nov. 15, 1993, 98(C11), p.20,307-20,319, 21 refs.

The role of seafloor topography in the spatial variations of the southern ocean sea ice cover as observed (every other day) by the Nimbus 7 scanning multichannel microwave radiometer satellite in the years 1980, 1983, and 1984 is studied. Bottom bathymetry can affect sea ice surface characteristics because of the basically barotropic circulation of the ocean south of the Antarctic Circumpolar Current. The main statistical tool used to quantify this effect is a local nonparametric regression model of sea ice concentration as a function of the depth and its first two derivatives in both meridional and zonal directions. The multiple correlation coefficient is found to average 44% in the Maud Rise study area and 62% in the Ross Sea study area over the years 1980, 1983, and 1984. A strategy of dividing the entire antarctic region into an overlapping mosaic of small areas, or windows, is considered. For a set of 3 representative days in the austral winter of 1980, the analysis shows that an average of 54% of the spatial variation in sea ice concentration over the entire ice cover can be attributed to topographic variables. The results thus support the hypothesis that there is a sea ice-to-bottom bathymetry link. (Auth. mod.)

F-49682

Pyne, A.R., **Fast ice behavior**, Antarctic Stratigraphic Drilling, Cape Roberts Project, Workshop report. Royal Society of New Zealand, Misc. Ser. No.23, Wellington, New Zealand, 1992, p.15-18.

The annual fast ice forms a persistent fringe 20 km wide and over 1.5 m thick around McMurdo Sound and Granite Harbour. It has for over 15 years provided safe routes for surface travel by heavy plant (e.g. D4, D5s) along the coast. Routes must be well flagged and cracks marked. The ice has also proved suitable in the spring as a drilling platform. A drilling win-

dow from Oct. 6, by which time full thickness is normally reached, to Nov. 15, after which seasonal warming begins to weaken the ice, is recommended. (Auth.)

F-49696

Heumann, K.G., **Determination of inorganic and organic traces in the clean room compartment of Antarctica**, *Analytica chimica acta*, Nov. 15, 1993, 283(1), International Symposium on Microchemical Techniques, 12th, Córdoba, Spain, Sep. 1992, edited by H.L. Pardue et al., p.230-245, 42 refs.

The concentration of most of the heavy metals in antarctic snow and ice lies in the low pg g^{-1} range and below. First indications have been obtained that cadmium is possibly influenced by biological processes in the polar sea. The nitrate content of precipitation in Antarctica agrees with the natural background level of 200-230 ng g^{-1} found in remote areas of the North and South Atlantic. HNO_3 is the most dominant nitrate form in the antarctic atmosphere and can be re-emitted from snow on the surface after its deposition. A natural cycle of nitrate in Antarctica is presented. High enrichment factors for iodine in relation to the chloride concentration have been observed in antarctic snow compared with the seawater composition. In the antarctic atmosphere, iodine is preferentially associated with the smallest aerosol particles, in contrast to chloride which shows the highest concentration in the larger sea salt particles. From this it follows that different types of substances must be responsible for this enrichment effect. HI , I_2 , HOI , and organoiodine have been identified as volatile iodine species in the atmosphere. Biogenically produced methyl iodide is the most abundant organoiodine compound and, after photodissociation, can act as a natural iodine contaminant in the interior of Antarctica. From these results a natural cycle could also be established for iodine. (Auth. mod.)

F-49698

Jeffries, M.O., Weeks, W.F., Shaw, R., Morris, K., **Structural characteristics of congelation and platelet ice and their role in the development of antarctic land-fast sea ice**, *Journal of glaciology*, 1993, 39(132), p.223-238, 36 refs.

Ice cores were obtained in Jan. 1990 from the land-fast ice in McMurdo Sound for a study of variations in texture, fabric, sub-structure, composition and development. Two primary ice types were observed, congelation and platelet, with a minor amount of frazil ice. Congelation ice growth precedes platelet-ice accretion. Congelation-ice fabrics show frequent moderate to strong alignments, a phenomenon believed to be due to water-current control of selective ice-crystal growth. Platelet ice originates at the base of the congelation ice, initially as a porous latticework of tabular ice crystals which subsequently consolidate by congelation of the interstitial water. The negative oceanic heat flux associated with platelet-ice formation in McMurdo Sound explains why McMurdo Sound fast ice is thicker than Ross Sea pack ice, and also why it reaches a greater thickness than arctic fast ice grown in a similar polar marine climate. Plate widths in the McMurdo Sound congelation ice suggest, however, that it grows no faster than arctic congelation ice. (Auth. mod.)

F-49699

Vaughan, D.G., **Relating the occurrence of crevasses to surface strain rates**, *Journal of glaciology*, 1993, 39(132), p.255-266, 54 refs.

This study derives a relationship between measurements of strain rate and observations of crevassing on the surface of ice masses. A literature search yielded 17 polar and alpine locations where strain rates had been measured and crevassing recorded. By plotting strain rates (converted to stresses using a creep law) using axes representing the surface-parallel principal stresses, failure envelopes were derived by enclosing measurements where surface crevassing was absent. The derived failure envelopes were found to conform well to theoretical ones predicted by the Coulomb and the maximum octahedral shear stress (von Mises) theories of failure. The derived failure envelopes were scaled by the tensile strength, which was found to vary from 90 to 320 kPa. There was no systematic variation of tensile strength with either temperature at 10 m depth or the method used to locate the crevasses. The observed relationship will provide a supplementary tool with which to verify and test models of ice dynamics against remotely sensed imagery. The study also indicates that a tempera-

ture rise of a few degrees throughout the ice column will not result directly in any increase in calving rates from the large antarctic ice shelves such as the Filchner-Ronne or Ross Ice Shelves. (Auth. mod.)

F-49700

Tison, J.L., Petit, J.R., Barnola, J.M., Mahaney, W.C., **Debris entrainment at the ice-bedrock interface in sub-freezing temperature conditions (Terre Adélie, Antarctica)**, *Journal of glaciology*, 1993, 39(132), p.303-315, 54 refs.

Debris-rich ice both from the bottom 6 m of the 82 m deep CAROLINE (Coastal Antarctic Record of Last Interglacial Natural Environment) ice core reaching bedrock, and from five 2 m long surface cores at Moraine Prudhomme in Adélie Coast is described and compared to debris-laden ice from the core-drilling site D10. Isotopic, total-gas content, CO₂ concentration and SEM investigations of embedded particles, together with ice textures and fabrics, rule out "pressure-melting" regelation around bed obstacles or "freezing-on" as possible mechanisms for the debris entrainment at the ice-bedrock interface. It is suggested that the debris entrapment by purely mechanical means (e.g. shearing) is an efficient process in forming basal ice layers at sub-freezing temperatures. This process might be dominant at a margin of the antarctic ice sheet where no ice shelf exists and where a ramp terminus or a buttressing coastal relief induces compressive flow. (Auth. mod.)

F-49701

Grosfeld, K., Blindow, N., **Determination of ice-shelf bottom melting by time-domain reflectometry**, *Journal of glaciology*, 1993, 39(132), p.353-356, 8 refs.

For application during the Filchner-Ronne Ice Shelf Programme (FRISP), a new technique for measuring the bottom-melting rate with high reliability was developed. The method is based on time-domain reflectometry (TDR) measurements of transmission lines inserted into melt holes. The TDR data are digitally recorded on magnetic tape. System resolution has been estimated at 0.2 m. Hence, re-measuring after 1 year gives an accuracy of 10% for melting rates of 2 m a⁻¹. Two transmission lines for TDR measurements were installed during the German FRIS Expedition of 1989-90. This paper describes the design of the system. Examples of recorded wave forms are given. (Auth. mod.)

F-49703

Delisle, G., **Global change, antarctic meteorite traps and the East Antarctic ice sheet**, *Journal of glaciology*, 1993, 39(132), p.397-408, 35 refs.

Numerical models to assess the principal response of large ice caps to climatic changes are used as a guide to the interpretation of field evidence of changes in the glaciological regime in the coastal areas of Victoria Land and north Victoria Land. Based on the theoretical work, the following scenario is proposed: areas within about 300 km from the coast of Victoria Land experienced significantly shallower ice slopes and a lesser degree of glaciation during most of the late Tertiary, steep slopes and thicker ice than today during glacial stages, and moderate thinning of the ice in intervening interglacial stages. The model predicts, for central Antarctica, a slightly thinner ice cap (lower snow accumulation rate) during glacial stages, but an estimated 200 m thicker ice cap in warmer Tertiary climates than today. The calculated "Tertiary ice caps" indicate a probable tendency of periodic surges due to basal melting at the outer fringes. Investigated ice fields include two meteorite traps—the Allan Hills Icefield and the Frontier Mountain meteorite fields. Antarctic meteorite traps are sustained by very specific glaciological conditions—in particular, only moderate changes in ice thickness over time. The sub-ice topography of these fields was determined by radar measurements and reveals a former very different glaciological regime, which is interpreted as being associated with glacial processes operative during the late Tertiary. Field evidence for a hypsithermal event during the Holocene is presented. (Auth. mod.)

F-49716

Minale, M., Astarita, G., **Heat-transfer analysis of the basal melting of antarctic ice shelves**, *Environmental and energy engineering*, Dec. 1993, 39(12), p.2019-2026, 20 refs.

Basal melting of antarctic ice shelves is an important element in the overall balance of antarctic ice. A heat transfer model for the basal melting of the Drygalski Ice Tongue is presented. The model does not contain any

adjustable parameter. The calculated basal melting rate agrees very well with the value estimated from an overall ice balance on the ice tongue. It is concluded that relatively simple concepts of transport phenomena may be used to model some important features of the dynamics of the antarctic ice sheet. (Auth.)

F-49723

Steiner, D.R., Ehlers, M., **Establishment of a digital database for the study of glacial velocity in Antarctica**, ACSM-ASPRS Annual Convention, Denver, CO, Mar. 18-23, 1990. Technical papers, Vol.4. Image processing/remote sensing, Bethesda, American Congress on Surveying and Mapping, 1990, p.369-377, 9 refs.

This paper describes the establishment of a digital database based on satellite images acquired over time, to be used for monitoring the velocities of the ice flow of Byrd Glacier in East Antarctica. Images acquired over a 10 year period are registered and georeferenced using established ground control points. The images are enhanced and used to measure the movement of prominent surface features. The resulting database of digitally processed "time lapsed" images provides a valuable source of information about glacial flow and ice sheet mass balance for use in global climate modeling. (Auth. mod.)

F-49732

Fujii, Y., **Drilling through the antarctic ice sheet**, *Polar news*, Aug. 1993, No.57, p.15-22, In Japanese.

The history of ice core drilling in Antarctica 1956-1993, and Greenland 1949-1992, is summarized. Included are sketch maps showing the sites, illustrations of some drills, and tables showing the year, site, drilling depth, drill type, and country of the major core drilling projects. Japan is planning an ice core drilling project over 2000 m deep on an ice dome about 1100 km south of Showa Station, to begin in 1995.

F-49780

Kaup, E., **Solar radiation in the water bodies of Queen Maud Land**, *Limnological studies in Queen Maud Land (East Antarctica)*. Edited by J. Martin, Tallinn, Valgus, 1988, p.15-27, 16 refs.

DLC QH84.2.L56

Investigations carried out on Schirmacher Ponds and Lake Unter-See are reported. Methods used in measuring total radiation, surface water albedo, the vertical distribution of solar radiation, and isophotes of total daily PhAR are described. The conditions for water absorption of radiation are discussed, including ice thickness and water transparency, the vertical distribution of PhAR and the daily sums of the isophotes. Results are presented in tables and graphs.

F-49809

Prentice, M.L., Fastook, J.L., Oglesby, R.J., **Early Pliocene antarctic interglaciations: climate and ice-sheet modeling results**, *Antarctic journal of the United States*, 1992, 27(5), p.35-37, 18 refs.

To reconstruct the ice sheet, the authors used a 2-dimensional, time-dependent, finite-element model of the antarctic ice sheet (Fastook and Prentice, in press). The model calculates a column-averaged ice velocity as a linear combination of creep and basal sliding. The resulting modeling suggests that, for Early Pliocene interglaciations characterized by mean annual surface air temperature of 3 C along the coastline, the antarctic ice sheet was probably considerably smaller than at present. This is because the base of the receding ice sheet probably was largely thawed. Further, if the mass balance of the simple climate model erred, it was probably on the high side; there is also the possibility of a calving bay. An obvious remaining question pertinent to constraining further Early Pliocene interglacial ice-sheet configurations is the duration of the warm climatic conditions. This factor could make the difference as to whether an ice sheet remained in interior East Antarctica or was completely ablated.

F-49810

Raymond, C.F., Weertman, B.R., Mulvaney, R., Peel, D.A., **Glaciological observations on Antarctic Peninsula**, *Antarctic journal of the United States*, 1992, 27(5), p.38-40, 6 refs.

At the site of ice coring carried out in 1989-1990 on the crest of the Dyer Plateau, measurements related to the ice coring were continued in 1991-1992. Aspects of a resurvey of the marker network around the core site and relocation of markers in a core hole for vertical strain are discussed. Reconnaissance measurements were carried out around a local ice summit of Beethoven Peninsula to provide a basis for planned ice coring on the west side of the Antarctic Peninsula, including radio echo profiling.

F-49811

Behrendt, J.C., **Possible effect of subglacial volcanism on changes in the west antarctic ice sheet**, *Antarctic journal of the United States*, 1992, 27(5), p.40-42, 9 refs.

Rapid changes in the west antarctic ice sheet (WAIS) may cause future global sea level changes. Hypotheses to account for observed changes in the ice streams of the WAIS include variations in the generation and transport of water and basal debris and in ice strength, but not greenhouse warming. The author suggests episodic subglacial volcanism and geothermal heating may have significantly greater effects on the WAIS than generally appreciated. He proposes that subglacial volcanic eruptions and ice flow in volcanically active areas should be considered to possibly have a forcing effect on the thermal regime resulting in increased melting at the base of the ice streams.

F-49812

Bentley, C.R., et al, **Radar experiments on ice stream B**, *Antarctic journal of the United States*, 1992, 27(5), p.43-44.

Teams from the University of Wisconsin (UW) and the Institute of Geography (IG), Russian Academy of Sciences, carried out field work in 1991-1992 in the vicinity of UpB camp at ice stream B that was devoted entirely to experiments with radar systems. The 5 systems were an 80 MHz impulse (short-pulse) system (GSSI model SIR8) (UW), a digitally recording 50 MHz SPRI Mark II system (UW), a UHF (620 MHz with optional pulse lengths of 0.1 microsecond and 0.7 microsecond) RLS-620 system (IG), a VHF (60 MHz) ARS-4 system (IG), and an HF (2 MHz and 8 MHz) MPI-8 system with digital as well as analog recording (IG). Methods and results are discussed.

F-49813

Whillans, I.M., **Glaciology and Global Positioning System at upstream B and from CASERTZ**, *Antarctic journal of the United States*, 1992, 27(5), p.45-46, 4 refs.

Field activities at ice streams B and C in 1991-1992 involved two phases. First, at the Upstream B (UpB) camp, the existing strain grid was enlarged and surveyed using the Global Positioning System (GPS) receivers and skidoos. Second, remote stations in the catchments of ice streams B and C that were installed in 1985-1986 were revisited using Twin Otters based at the CASERTZ (corridor aerogeophysics of the southeastern Ross transect zone) camp. The motivation was to obtain a more precise calculation of the mass balance of ice streams B and C and their catchments. The discharge of ice stream B is 41% greater than replenishment by new snow accumulation, hence, the region must be thinning. The major uncertainties in the calculation are due to inadequate knowledge of the surface snow accumulation rate and the limits to the catchment area. Both problems are addressed in this program. The resurveying for position will yield ice velocity vectors and help determine through which ice stream each portion of the catchment drains. The cores will be analyzed to determine the 36 year average accumulation rate.

F-49814

Jacobel, R.W., Nelson, K.E., Bindshadler, R.A., **Radar studies of ice thickness and surface features at the mouths of ice streams D and E, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.47-49, 5 refs.

During the 1991-1992 field season, surface-based ice thickness and elevation measurements were made near the grounding line at the mouths of ice streams D and E as a part of the continuing effort to understand the state of the west antarctic ice sheet and its response to climate change. The purpose of these studies was twofold: first, to determine ice thickness for mass-balance calculations for these ice streams, and second, to use the radar to investigate features in the surface topography observed in Landsat Thematic Mapper (TM) images. The system used was a short-pulse radar operating at a center frequency of 2 MHz, which has been described by

Jacobel et al. (1988). Modifications since that report include a PC-based data acquisition system that allows higher data rates and the use of color displays in the field. The system with operator was towed on a Nansen sled by a skidoo, and data were recorded with a density of one waveform every 10 m. In total, approximately 25 megabytes of data were collected, corresponding to 110 km of total surface travel. Graphical results are presented.

F-49815

Alley, R.B., **Sticky spots under ice streams**, *Antarctic journal of the United States*, 1992, 27(5), p.50-51, 13 refs.

Sticky spots on the bed of an ice stream can be caused by several mechanisms. The form drag of any large bedrock bumps could be significant. Geophysical surveys can identify such bedrock bumps, and model calculations can then estimate the stresses involved. Regions of thin or zero till might create sticky spots but would collect water from their surroundings and increase their lubrication, limiting the maximum shear stress. Water-pressure measurements in boreholes might detect such sticky spots. Surface highs, which are readily detected through radar altimetry from aircraft or by surface surveying, also might cause sticky spots, but would be limited by the same mechanism. If the water supply to an ice stream were turned off from upglacier, the lubrication mechanism for thin-till regions would no longer act efficiently. Without such lubrication, characteristic velocities over any such sticky spots would be greatly reduced, and the ice stream might even stop. It is suggested that such a mechanism might have contributed to the stoppage of ice stream C which occurred in the last century or two.

F-49818

Grootes, P.M., Steig, E.J., **Taylor Dome ice-core study**, *Antarctic journal of the United States*, 1992, 27(5), p.57-58, 2 refs.

From Nov. 30, 1991, until Jan. 22, 1992, two field parties continued the 1990-1991 reconnaissance and drill site selection on Taylor Dome and the upper Taylor Glacier. Observations during both field seasons of snow drifts and frequent wind-packed hard layers in pit profiles indicate that an important part of the accumulation may occur as drifts, and thus is not uniform over the area. Annual layers may be missing at some locations and the mean annual accumulation will be less than the apparent seasonal cycles of about 20 cm in pit profiles. The isotope-depth profiles of the 11 pits of 1990-1991 document important isotope differences across the Taylor Dome field area. Results obtained in the field and in the laboratory support the choice of the 20 C area as a prospective drill site.

F-49819

Morse, D.L., Waddington, E.D., **Glacier geophysical studies for an ice-core site at Taylor Dome: year two**, *Antarctic journal of the United States*, 1992, 27(5), p.59-61, 7 refs.

During the 1990-1991 and 1991-1992 field seasons, a program was carried out to study the ice dynamics of Taylor Dome in support of an ice-core paleoclimate project intended to compare the ice core results with the geologic record obtained in the Taylor Glacier terminus region. The main objectives are to provide the depth-age relationship for the ice core, and to predict the Taylor Glacier terminus response to climate forcing. The initial goal is to find a drill site in a simple ice-flow regime where climatic indicators are well preserved.

F-49867

Druivenga, G., Thierbach, R., **Ice thickness measurements in north Victoria Land using radar echo sounding (RES)—GANOVEX V Expedition**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.197-209, With German and Russian summaries. 4 refs.

During the GANOVEX V expedition, geophysical and glaciological studies were supplemented by radar echo soundings (RES) to measure ice thickness. The ice thickness was measured at numerous seismic and gravimetric stations, both on the Tourmaline Plateau and Campbell Glacier in the south and in the Kavrayskiy Hills near Rennick Glacier in the north. Satisfactory results were also obtained along a profile on the western margin of Campbell Glacier. Towards the west, between the Kavrayskiy Hills and Usarp Mountains, the base of the ice was found to slope steeply to about sea level. Further along the profile there was a total lack of reflection.

tions over a distance of about 1 km. It is possible that the ice/bedrock boundary drops considerably below sea level; a satisfactory explanation can only be obtained if the survey is continued to the Usarp Mountains. (Auth.)

F-49884

Makinson, K., **BAS hot water drill: development and current design**, *Cold regions science and technology*, Nov. 1993, 22(1), p.121-132, 14 refs.

Over the past decade the British Antarctic Survey has developed a hot water drilling system that uses components easily carried by Twin Otter aircraft. The system has recently been upgraded and was successfully used in the 1990-91 and 91-92 field seasons to penetrate ice up to 562 m thick on Ronne Ice Shelf. Holes of at least 0.13 m in diameter were created and maintained. The hot water drill incorporates 300 kW of heating power with a water re-circulation system, removing the need for continuous snow melting while drilling. The drill nozzles have been designed to combat the problems of the rapid re-freezing of the water-filled hole. In the event of borehole closure above the nozzle, a less powerful but still effective drilling action is available upwards. A compressible mechanical valve system is incorporated which increases the back pressure when the operator is drilling too fast. This system ensures that the nozzle is always freely suspended, resulting in a vertical hole. The work has allowed oceanographic measurements to be made in the sea-water underlying George VI Ice Shelf and Ronne Ice Shelf. The access holes have also been used for the installation of sensors in the ice and the ocean for long-term temperature monitoring. (Auth. mod.)

F-49910

Egorova, V.A., Kazanskii, M.M., Kononova, S.A., **Thermohaline structure around waters in coastal glaciers and icebergs** [Termokhalinnaya struktura vod u pribrezhnykh lednikov i aysbergov], *Zapiski po gidrografii*, 1987, No.217, p.35-39, In Russian. 4 refs.

Characteristics of the hydrological conditions and theoretical sources of variations in the oceanographic properties of waters in icebergs and glaciers are discussed. Data from McMurdo Sound, the Weddell Sea, Lazarev Bay, Erebus Glacier Tongue, and Conception Bay are reviewed. In order to assess objectively the physical nature of the various processes changing the water structure developing in the glacier/iceberg-sea layer system, and to determine these processes quantitatively, the authors also propose a method of study. (Auth. mod.)

F-49912

Jeffries, M.O., et al, **Crystal structure, stable isotopes ($\delta O-18$), and development of sea ice in the Ross, Amundsen, and Bellingshausen seas, Antarctica**, *Journal of geophysical research*, Jan. 15, 1994, 99(C1), p.985-995, 28 refs.

The crystal structure and oxygen isotopic composition of ice cores obtained from floes at the end of summer in the eastern Ross Sea, the Amundsen Sea, and the western Bellingshausen Sea were investigated to determine the ice growth processes and conditions that contribute to sea ice development in the eastern Pacific sector of the southern ocean. The isotope data indicate that a moderate amount of snow contributes to the development of the sea ice. However, even the combined use of isotopes and crystal structure analysis does not unambiguously explain the means by which all of the snow is entrained in the ice. Nevertheless, it seems clear that much of the snow is contained in granular snow-ice that results from seawater flooding of floes and the base of the snow cover. The snow cover in the Ross-Amundsen region was as much as 2 m deep and supported by 7- to 8-m thick floes primarily composed of frazil ice. In the Bellingshausen region the snow cover and the floes were thinner than in the Ross-Amundsen region. The Bellingshausen cores were composed primarily of multiple layers of frazil and congelation ice. In addition, in both regions there were numerous tipped or inclined blocks of congelation ice and layers of rafted nilas in the cores. The data indicate that the sea ice develops by multiple mechanisms in a turbulent environment. (Auth.)

F-49913

Muramoto, K., Matsuura, K., Endoh, T., **Measuring sea-ice concentration and floe-size distribution by image processing**, *Annals of glaciology*, 1993, Vol.18, International Symposium on

Snow and Snow-related Problems, Nagaoka, Japan, Sep. 14-18, 1992. Proceedings. Edited by S.C. Colbeck et al, p.33-38, 9 refs.

A technique for analyzing sea ice concentration and floe size distribution by means of image processing is proposed. The sea ice was photographed by a shipboard video camera. The technique proposed for analyzing sea ice images can be applied with or without computer analysis. In on-line analysis, sea ice images photographed by a video camera are digitized in real time. Ice concentration is calculated by summing ice pixels of each row of a digital image, and ice shape can be obtained roughly by a composition of each row. In off-line analysis, sea ice images recorded to a video recorder are processed. Both ice shape and ice concentration can be obtained accurately by analyzing predetermined square regions of an image. Although the off-line method requires more time to calculate, it is useful for detailed analysis of regional ice properties. Computations of ice concentrations and floe size distribution were performed using images obtained between Breid Bay and Showa Station in 1988. (Auth. mod.)

F-49914

Kawamura, T., Ohshima, K.I., Ushio, S., Takizawa, T., **Sea-ice growth in Ongul Strait, Antarctica**, *Annals of glaciology*, 1993, Vol.18, International Symposium on Snow and Snow-related Problems, Nagaoka, Japan, Sep. 14-18, 1992. Proceedings. Edited by S.C. Colbeck et al, p.97-101, 8 refs.

A two-year study was conducted on the growth processes of sea ice in Ongul Strait. Routine measurements of snow depth and ice thickness were made and sea-ice cores were collected to assess their structure, temperature and salinity. The snow depth varied from 0 to about 1 m. In the winter months, the growth rate is higher in bare-ice regions than in snow-covered regions. However, over the year, the ice thickness is lower in the bare-ice regions than in the snow-covered regions. Sea ice in the snow-covered regions increased in thickness in spring rather than in winter, due to the formation of snow-ice and by ice formation related to the melting of snow cover. (Auth. mod.)

F-49915

Langway, C.C., Jr., Shoji, H., Mitani, A., Clausen, H.B., **Transformation process observations of polar firn to ice**, *Annals of glaciology*, 1993, Vol.18, International Symposium on Snow and Snow-related Problems, Nagaoka, Japan, Sep. 14-18, 1992. Proceedings. Edited by S.C. Colbeck et al, p.199-202, 4 refs.

The transformation of snow to ice under compressive stress is a very slow process unless meltwater is present. A qualitative measure of permeability variation with depth was continuously determined for various shallow-ice cores from the dry snow zones in both Greenland and Antarctica to investigate this transformation process. Results of the study provide insight into snow densification mechanisms and generally characterize the pore close-off phenomena. Measurements show that bulk densities may be expressed as a function of overburden; pore close-off takes place when the overburden is approximately 3.0-4.5 bar. (Auth.)

F-49916

Shoji, H., Mitani, A., Horita, K., Langway, C.C., Jr., **Crystal growth rates in polar firn**, *Annals of glaciology*, 1993, Vol.18, International Symposium on Snow and Snow-related Problems, Nagaoka, Japan, Sep. 14-18, 1992. Proceedings. Edited by S.C. Colbeck et al, p.208-210, 4 refs.

In a study of the processes of firn metamorphism, continuous crystal-size measurements were made on the G6 antarctic ice core (100 m deep), which show enhanced growth rates above a depth of 30 m (Zone 1) and in the interval between 70 and 80 m (Zone 2). Crystal growth in Zone 1 likely takes place by a process of sublimation and condensation. The higher growth rate in Zone 2 is most probably related to the pore close-off transformation process, in which a non-uniform strain field is created to form air bubbles by plastic deformation and "cannibalization" of individual ice crystals. (Auth. mod.)

F-49919

Ushio, S., Takizawa, T., Ohshima, K.I., Kawamura, T., **Thermal structure of the coastal polynya off Syowa Station, Antarctica**, *Antarctic record*, Nov. 1993, 37(3), p.252-259, In Japanese with

English summary. 5 refs.

Open water areas between fast-ice and pack-ice zones are frequently observed off Lützow-Holm Bay. In such open waters, called polynyas or leads, which are exposed to the cold air, new sea ice can form with a high growth rate; the open polynya releases large quantities of heat to the atmosphere and excludes high-salinity brine from the ocean. In 1990-1992, JARE-31 and JARE-32 conducted oceanographic observations in Lützow-Holm Bay to reveal the atmosphere-sea-ice-ocean interaction. Thirty AXBTs (aircraft-deployed expendable bathythermograph) were dropped to examine the thermal structure in the polynya "Ôtone Suirô". Based on the results, the depths of the winter convective-mixed layer were estimated. The thickness of the mixed layer near the freezing point (about -1.8 C) reached to 350-450 m. These mixed layers were thicker than those in the offshore pack-ice region. (Auth. mod.)

F-49921

Salamatin, A.N., Lipenkov, V.I.A., **Theoretical studies on densification and relaxation of bubbly glacier ice**, *Antarctic record*, Nov. 1993, 37(3), p.265-276, 23 refs.

This paper presents a brief review of the authors' earlier research on polar ice density modeling carried out and published during 1983-1989. A theoretical approach to macrocontinuum description of bubbly ice densification or expansion on the basis of averaging asymptotic methods is considered. Mathematical models for the simulation of polar ice sheet density variations vs. depth and for the prediction of deep ice core volume relaxation after its recovery are developed and tested on real situations at Vostok Station. A simplified model for the equilibrium transformation of bubbles entrapped in ice into air hydrate crystals is proposed. (Auth.)

F-49937

Smedley, D.J., Kwok, K.C.S., Kim, D.H., **Snowdrifting simulation around Davis Station workshop, Antarctica**, *Journal of wind engineering and industrial aerodynamics*, 1993, Vol.50, International Colloquium on Bluff Body Aerodynamics and its Applications, 2nd, Melbourne, Dec. 1992. Proceedings, p.153-162, 11 refs.

This paper describes the simulation of turbulent boundary layer flow in a wind tunnel for the study of snowdrifting around antarctic buildings. Profiles of mean wind speed and turbulence intensity, and the longitudinal turbulence spectrum, are presented. Similarity parameters proposed by other researchers are applied to the simulation. Snowdrifting around the workshop building of Davis Station was investigated. Two attachments to the building were tested to find a way of alleviating a known snowdrifting problem. (Auth.)

F-49942

Saltzman, B., Verbitskii, M.I.A., **CO₂ and glacial cycles**, *Nature*, Feb. 3, 1994, 367(6462), p.419, 10 refs.

A graph is presented with plots of CO₂ vs. ice volume to show the phase-plane trajectories of these two variables. The trajectories tend to form two main 100,000-year period loops with a clockwise flow, signifying a phase lag between the two variables such that high CO₂ is associated with decreasing ice volume and lower CO₂ with increasing ice volume. Vostok ice core data are used to construct the graph.

F-49947

Langway, C.C., Jr., et al, **New chemical stratigraphy over the last millenium for Byrd Station, Antarctica**, *Tellus*, Feb. 1994, 46B(1), p.40-51, 32 refs.

A 164 m-deep, 10 cm diameter ice core was obtained at Byrd Station surface camp (NBY89), in Nov. 1989. In addition, two 10 m shallow cores were recovered at 14 km and 29 km distances upstream from the main core; 2 m-deep pits were dug at each drilling location. Over 2300 individual samples were analyzed for ionic concentration levels in continuous but selected depth intervals. Results of the study provided a continuous 1360 year chronology for the 164 m core based on multiple cross-correlations of $\delta^{18}\text{O}$, ECM (Electrical Conductivity Method) and ionic chemistry data combined with megascopic stratigraphy and physical properties. This establishes a reliable chronological connection between the new NBY89 core data with the older ice core records which extends back to Early Wisconsin age. (Auth. mod.)

F-49982

Moore, J.C., Fujita, S., **Dielectric properties of ice containing acid and salt impurity at microwave and low frequencies**, *Journal of geophysical research*, June 10, 1993, 98(B6), p.9769-9780, 36 refs.

This paper compares the microwave and low-frequency (LF) dielectric conductivity of natural and artificial ice, including ice samples from Dolleman I., as a function of impurity concentration and temperature. A linear dependence of conductivity on acid concentration that is independent of the type of acid is found. There appears to be no evidence of significant dielectric dispersions between LF and 10 GHz in acid-doped ice. The results are well fitted by a model in which concentrated liquid acid at three-grain boundaries forms a network, earlier proposed as an explanation for the DC conductivity of polar ice. In contrast, evidence from ice with sea salt impurity shows large discrepancies between the microwave response of low-salinity sea ice, and both the LF and microwave responses of ice with salinities typical of meteoric ice. These discrepancies may be attributed to sea salt chloride being largely incorporated within the ice lattice in meteoric-type ice, while in higher-salinity ice most of the sea salt is contained in platelike inclusions of liquid brine. (Auth. mod.)

F-49984

Menashi, J.D., et al, **Low-frequency passive-microwave observations of sea ice in the Weddell Sea**, *Journal of geophysical research*, Dec. 15, 1993, 98(C12), p.22,569-22,577, 24 refs.

The microwave emission properties of first-year sea ice were investigated from the R/V *Polarstern* during the Antarctic Winter Weddell Gyre Project in 1989. Radiometer measurements were made at 611 MHz and 10 GHz and were accompanied by video and visual observations. Based on the theory of radiometric emission from a layered medium, a method for deriving sea ice thickness from radiometer data is developed and tested. The model is based on an incoherent reflection process and predicts that the emissivity of saline ice increases monotonically with increasing ice thickness until saturation occurs.

F-49985

Perovich, D.K., **Theoretical model of ultraviolet light transmission through antarctic sea ice**, *Journal of geophysical research*, Dec. 15, 1993, 98(C12), p.22,579-22,587, 43 refs.

To assess the impact of enhanced incident ultraviolet irradiance on the sea ice microbial community, a knowledge of the amount of light transmitted through a sea ice cover is necessary. A two-stream radiative transfer model is used here to estimate the penetration of ultraviolet radiation through antarctic sea ice. Sea ice optical properties were used as proxies to infer scattering and absorption coefficients at ultraviolet wavelengths. Case studies are reported for sea ice in McMurdo Sound and in the Weddell Sea. Values of spectral transmittance are computed as well as integrated transmitted UV-B, UV-A, biologically effective irradiance (BEI), and photosynthetically active radiation (PAR). UV-B light levels under meter-thick ice are a few percent of incident values. The presence of a snow cover results in a large decrease in transmitted ultraviolet. Snow and ice ameliorate the biological impact of enhanced levels of incident ultraviolet radiation by reducing the BEI relative to the PAR. (Auth. mod.)

F-49988

Heyke, H.E., **Solubility of carbon dioxide in solid water** [Zur Löslichkeit von Kohlendioxid in festem Wasser], *Erdöl & Kohle, Erdgas, Petrochemie*, Dec. 1993, 46(12), p.467-469, In German with English summary. 16 refs.

A basic problem in climatology concerns the role of atmospheric CO₂ in global climatic changes. This refers to the quantity of CO₂ confined in frozen water (ice or snow) by adsorption, absorption or "chemisorption". During the spectroscopic determination of CO₂ in the air and in gas bubbles trapped in the Antarctic and Greenland ice cores, the moisture in the gas sample is frozen out. This step seems to have an effect on the CO₂ values obtained. Bearing the significance of the CO₂ problem in mind, the accuracy of the applied method should be evaluated. (Auth. mod.)

F-49991

De Mora, S.J., Whitehead, R.F., Gregory, M., **Chemical composition of glacial melt water ponds and streams on the McMurdo Ice Shelf, Antarctica**, *Antarctic science*, Mar. 1994, 6(1), p.17-

27, Refs. p.26-27.

Melt waters cover c. 20% of the McMurdo Ice Shelf during the austral summer. The streams, ponds, and lakes up to 10^4 m^2 in area occur in two types of terrain systems with differing morphological, chemical, and biological characteristics: pinnacled ice (PI) areas with sparse sediment cover, low relief, and little biomass; and ice-cored moraine (ICM) areas with 10-20 cm sediment cover, hummocky topography with up to 20 m relief, occasional mirabilite deposits, and dense benthic cyanobacterial mats. Pond water composition in the two areas is markedly different. PI area melt waters have low salinities, and near neutral pH. The chemical composition of PI waters closely follows that of diluted sea water, suggesting that the release of ions from the sea ice matrix of the ice shelf is the major solute source. In contrast, ICM area melt waters have a wide range of salinities. The chemical composition in c. 40% of the ICM ponds investigated did not resemble that of sea water. Leaching of local salt deposits, particularly mirabilite, weathering of surficial sediments, and morphological features promoting closed-basin brine evolution are possible contributing factors to the enrichments. (Auth. mod.)

F-50014

Chinn, T.J., Dickson, R.H.J., **Hydrology and glaciology, Dry Valleys, Antarctica: annual report for 1982-1983, New Zealand. Ministry of Works and Development. Report**, Nov. 1986, WS 1188, 95p., 14 refs.

This work describes an investigation of long- and short-term climatic fluctuations in the Dry Valleys region by the study of glaciers, summer meltwater streams and the levels of enclosed lakes. Apart from a series of strong westerly winds early in the season there were no notable meteorological events over the 1982-83 summer. Flow records of the Onyx River were made at two sites, and the total measured seasonal discharge into Lake Vanda was $4.8 \times 10^6 \text{ m}^3$. Lake Vanda rose 654 mm over the summer, while the levels of 8 other lakes measured changed from +395 mm (Lake Fryxell) to -31 mm (Lake Joyce). A complete record of water levels of Don Juan Pond was obtained for the winter of 1982. An anemograph installed during the summer showed that water levels of this "lake" fluctuate with the wind. Glacier mass-balance measurements (Heimdall Glacier) and ablation measurements on various glaciers continue to show small gains and losses consistent with past years. Mean annual ablation losses (in mm water equivalent) were: Wright Lower Glacier, -69; Clark Glacier, -82; and Wright Upper Glacier, -217. (Auth. mod.)

F-50019

Legrand, M.R., **Ice core analysis in arctic and antarctic regions**, NATO Advanced Research Workshop on the Tropospheric Chemistry of Ozone in the Polar Regions, Wolfville, Nova Scotia, Canada, Aug. 22-28, 1992. Proceedings. Edited by H. Niki et al and NATO Advanced Science Institutes, Series I. Global environmental change. Vol.7, Berlin, Springer-Verlag, 1993, p.205-217, 35 refs.

DLC QC879.73.P6T76

This paper presents state-of-the-art glaciochemistry for polar ice cores, focusing mainly on the presence of soluble mineral species and some light carboxylates. After a brief overview of contamination control techniques of trace measurements, the basics of the ionic composition of snow as well as the origins and sources of these chemicals in polar regions are discussed. Then the glaciochemistry of primary aerosols (sea salt and terrestrial compounds), in particular their response to large climatic changes which have occurred in the past, is analyzed. The glaciochemistry of the secondary sulphur aerosols (e.g., aerosol produced during gas-to-particle conversion) and the modulation of its budget by both large volcanic eruptions and marine biogenic emissions is discussed. NO_3^- ice core data in terms of the atmospheric N-cycle (i.e., contribution of various sources to its budget, anthropogenic influence via acidification of precipitation or recent "ozone hole"), are analyzed, and finally it is shown that Greenland precipitation exhibits some large increases in NH_4^+ and organic acid contents in narrow layers. This suggests that the atmosphere in high northern latitudes has been disturbed by strong inputs originating from high-latitude forest fires. (Auth. mod.)

F-50020

Neftel, A., Fuhrer, K., **Record of atmospheric oxidant from polar ice cores over the past 100,000 years: dream or real pos-**

sibility, NATO Advanced Research Workshop on the Tropospheric Chemistry of Ozone in the Polar Regions, Wolfville, Nova Scotia, Canada, Aug. 22-28, 1992. Proceedings. Edited by H. Niki et al and NATO Advanced Science Institutes, Series I. Global environmental change. Vol.7, Berlin, Springer-Verlag, 1993, p.219-233, 24 refs.

DLC QC879.73.P6T76

There is not an easily determined parameter in polar ice cores which yields a measure for the burden of atmospheric oxidants. O_3 and OH are most likely not recorded at all. Under special circumstances H_2O_2 shows a concentration pattern that might reflect an atmospheric pattern. The chemical information in the ice core has to be decoded, and a quantitative understanding of the transfer function has to be developed in the near future. At present, the bulk of information regarding reversibly deposited species is restricted to H_2O_2 . (Auth. mod.)

F-50027

Hindmarsh, R.C.A., **Modelling the dynamics of ice sheets**, *Progress in physical geography*, Dec. 1993, 17(4), p.391-412, Refs. p.409-411.

This paper reviews current research on ice grounding and the relation of this process to ice sheet oscillation. Although the mechanics and qualitative dynamics of grounded ice sheets and ice shelves in arctic and antarctic regions are fairly well understood, this is not true for the transition between the two. In consequence, the existence and nature of any grounding line instability have yet to be established. Further problems are understanding how uncertainties in input parameters affect results, and obtaining optimal techniques for parameter inference using ice-sheet models. (Auth. mod.)

F-50105

Gore, D.B., **Changes in the ice boundary of the Vestfold Hills, East Antarctica, 1947 to 1990**, *Australian geographical studies*, Apr. 1993, 31(1), p.49-61, 12 refs.

The position of the ice boundary around the Vestfold Hills was observed using a 43 year record of aerial photography, from 1947 to 1990. The southern boundary, formed by Sørsdal Glacier, showed two main areas of ice retreat and no areas of advance. Stagnation and retreat of this boundary is interpreted to be contraction to former limits following the Chelnok Glaciation which occurred before 700 years BP. The eastern or continental ice sheet boundary showed five sites of rapid localized incision and downwasting around supraglacial gullies. While no area of continental ice was noted to advance, continued accumulation and firnification of wind-drifted snow in the proglacial zone of the ice sheet in the southeastern corner of the hills may signify a locally positive ice mass balance. Until ice mass balance studies are carried out in the ablation zone surrounding the hills, evidence concerning whether the ice sheet boundary is retreating, stable or advancing will remain equivocal. (Auth.)

F-50116

Baroni, C., Frezzotti, M., Meneghel, M., Smiraglia, C., **Evaluation of the dynamic parameters of Strandline Glacier** [Valutazione dei parametri dinamici del ghiacciaio Strandline (Baia Terra Nova, Antartide)], *Geografia fisica e dinamica quaternaria*, 1992, 15(1-2), p.41-42, In Italian with English summary. 9 refs.

During the expeditions of the Italian Antarctic Research Program from 1986 to 1991, measurements of the dynamic parameters were carried out on the Strandline Glacier. This is a small cold local glacier that flows very slowly (up to 3 m/yr). Its frontal ice cliff is stable or locally in slight retreat. The mass balance is in slight deficit (between about - 8,000 to - 13,000 $\text{m}^3/\text{yr w.e.}$). (Auth.)

F-50117

Frezzotti, M., **Remote sensing analysis of Victoria Land ice shelves and ice tongues** [Analisi delle piattaforme e delle lingue di ghiaccio galleggianti della Terra Vittoria (Antartide) tramite immagini da satellite e fotografie aeree], *Geografia fisica e dinamica quaternaria*, 1992, 15(1-2), p.107-109, In Italian with English summary. 9 refs.

Analysis of satellite images (Landsat 1 MMS, 4 TM and SPOT 1 XS), of U.S. Navy aerial photographs (TMA) and USGS maps were used to collect information on ice front, areal variations and rates of flow of ice shelves and ice tongues in the Terra Nova Bay area. Comparison among different documents taken several years apart (from 1960 to 1990) allowed estimation of ice velocities. The mean ice velocity of ice tongues and ice shelves ranges from 30 m/yr to 900 m/yr. The highest velocities are found at the outer margin of Drygalski Ice Tongue. (Auth.)

F-50118

Orombelli, G., **Glaciological investigations in the Italian National Antarctic Research Program** [Le ricerche glaciologiche nell'ambito del "Programma Nazionale di Ricerche in Antartide": risultati e prospettive], *Geografia fisica e dinamica quaternaria*, 1992, 15(1-2), p.133-134, In Italian with English summary. 30 refs.

The results of glaciological research carried out in Antarctica between 1985 and 1991 are briefly presented. Collaboration in international research programs is planned for future field seasons. A reference list of the papers published so far is supplied. (Auth.)

F-50141

Lytle, V.I., **Ku-band (13.9GHz) radar backscatter over sea ice in the southern ocean**, Hanover, Dartmouth College, 1993, 324p., University Microfilms order No.93-31961, Ph.D. thesis. Refs. p.313-324.

The goal of this research was to develop a technique to map and monitor the sea ice cover of the southern ocean using spaceborne radar altimeter data. Backscatter data collected during the experiments utilized a Ku-band (13.9GHz) radar which was operated at near normal incidence, similar to the radar altimeter aboard the GEOSAT satellite. Field work was carried out in the Weddell Sea where extensive ice physical properties and backscatter measurements were collected. Results from this work showed that a slush layer at the snow/ice interface is a characteristic feature of the Weddell Sea ice pack and that it has a strong influence on the radar backscatter cross-section. Furthermore, this slush, which is often not visible on the surface, can be monitored using a ship based radar. Laboratory results were used to confirm that slush can have a dominant effect on the radar backscatter cross-section. Laboratory results also showed that while a snow cover weakly influences backscatter strength, a roughening of the ice surface by the snow cover can have a profound effect at normal incidence. These observations were combined into a model which describes the shape of radar altimeter waveforms collected over sea ice. (Auth. mod.)

F-50149

Moore, J.C., Reid, A.P., Kipfstuhl, J., **Microstructure and electrical properties of marine ice and its relationship to meteoric ice and sea ice**, *Journal of geophysical research*, Mar. 15, 1994, 99(C3), p.5171-5180, 33 refs.

A 215 m ice core has penetrated the central part of the Ronne Ice Shelf. The core consisted of meteoric ice above 152.8 m depth; below this the ice was bubble free, and of seawater origin. The salinity of the layer below 152.8 m depth is less than 0.05 ppt, very much lower than typical sea ice. The ice represents an unusual source of ice intermediate in salinity and some physical properties between meteoric ice and sea ice. The structure of the ice from four different depths, where salinities vary by a factor of 4, has been investigated using a scanning electron microscopy. The fabric and grain structures are unusual and seem to depend on the impurity concentration in the ice. Chemical impurity localization has also been investigated. The dielectric properties show that the ice has a transitional behavior from the linear dependence of conductivity on chloride concentration found in meteoric ice, to the less predictable sea ice behavior. The behavior may be interpreted in terms of the structure of the ice. The higher-salinity samples show convoluted grain boundaries, small grain size, and brine inclusions. There are indications that the brine inclusions were liquid at temperatures between -10 C and -30 C. By contrast, the lower-salinity samples possess larger grain sizes and show no evidence of brine inclusions. All samples show brine concentrated at triple grain junctions and also along two-grain boundaries in higher-salinity samples. The dielectric properties of the lower-salinity samples are well described by a Jaccard mechanism with L defects created in proportion to salinity, that also describes the behavior of meteoric ice. Higher-salinity samples

exhibit lower conductivity than would be seen if L defects continued to be created in proportion to salinity. The dielectric and structural data are consistent with a solubility limit of about 300 micronM for Cl in the ice lattice. (Auth.)

F-50153

ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993, **Proceedings. Space at the service of our environment**, Paris, European Space Agency, 1994, 1360p. (2 vols.), ESA SP-361, Refs. passim. For selected papers see 48-3434 through 48-3487 or E-50175, F-50154 through F-50169, F-50172, F-50174, I-50173, J-50170, J-50171 and L-50176.

This is a collection of papers presented at the 2nd ERS-1 Symposium held in Hamburg, Germany, Oct. 11-14, 1993. Twenty three of the papers concern Antarctica, and appear in the following sections of the two volumes: glaciology, sea ice, ocean circulation, interferometry (methodology and tools), atmospheric parameters and processes as seen from ERS-1, and snow. In the Posters section, 2 articles deal with geomorphological mapping of the Potter Peninsula and gravity field of the Ross Sea region, respectively.

F-50154

Bamber, J.L., Bentley, C.R., Morley, J.G., Rapley, C.G., **Antarctic topography derived from ERS-1 altimetry**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.113-117, ESA SP-361, 11 refs.

Several 35-day repeat cycles of Fast Delivery altimeter data have been used to produce a Digital Elevation Model (DEM) for the antarctic ice sheet and the Ross Ice Shelf. Corrections for surface slope, atmospheric attenuation and instrumental biases were applied to the data to produce the most accurate maps currently available. The DEMs were compared with ground truth data including radio echo sounding and GPS measurements. Some large discrepancies between previously published maps and the altimeter derived datasets were found; these are discussed. (Auth.)

F-50155

Ihde, J., et al, **Analysis of ERS-1 radar altimeter data over Antarctica**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.119-125, ESA SP-361, 11 refs.

Orthometric heights (sea heights) for ice sheets of Antarctica from ERS-1 radar altimeter data up to latitude -82 deg are derived. An algorithm for profile adjustment of repeated observations along the ERS-1 sub-satellite track is developed. The analysis of the ERS-1 radar altimeter measurements shows a high potential of accuracy and resolution for the determination of ice sheet elevations in Antarctica. Particularly on ice shelves and flat mainland ice areas, heights with an internal accuracy of better than 1 m can be derived along the sub-satellite profile. For the 35 day repeat cycle (35-DRC) more than 50% of the heights of the ERS-1 crossed areas of antarctic land ice have an internal accuracy of better than 1 m. The result is a slope-corrected digital terrain ice model (DTIM) and a Contour Map of Antarctic Ice Sheets (Scale 1:30,000,000) on the basis of more than 215,000 mean land ice heights derived from repeated 35-DRC radar altimeter observations. Results of comparison with heights of other sources are discussed. (Auth. mod.)

F-50156

Wingham, D.J., Arthern, R.J., Curtis, D.C., Proud, J.J., **Measuring ice sheet changes with the ERS-1 altimeter**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.127-131, ESA SP-361, 12 refs.

The use of altimeter observations to determine changes in the elevation of ice sheets is complicated by the presence of topography. In this paper, some new results concerned with overcoming this problem are summarized. The results imply that some of the procedures used to reduce altimeter observations over ice sheets should be changed, in particular the

procedure known as "retracking". The difficulty introduced by the radial orbit error is also discussed. Examples of ERS-1 data from Antarctica are included. (Auth.)

F-50157

Rott, H., Miller, H., Sturm, K., Rack, W., **Application of ERS-1 SAR and scatterometer data for studies of the antarctic ice sheet**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.133-139, ESA SP-361, 11 refs.

The spatial distribution of backscattering characteristics over Antarctica has been investigated based on scatterometer data of ERS-1 AMI. Three parameters were identified which characterize different regimes of polar firm: the mean intensity, the incidence angle gradient, and the azimuthal asymmetry of backscattering. Spatial variations of these parameters result from variations of snow metamorphic state related to accumulation rate, temperature, and wind. Time series of scatterometer measurements enable monitoring the extent and duration of summer melt occurring in coastal areas and on the Antarctic Peninsula. Over the interior of Antarctica the backscattering coefficients were found to be very stable with time. This offers opportunities for monitoring sensor stability and for sensor intercalibrations. Examples are presented for ERS-1 SAR images of ice shelves in East Antarctica and on the Antarctic Peninsula. Valuable glaciological information can be extracted from the SAR images, including ice boundaries, ice flow features, and properties of surface and sub-surface morphology. (Auth.)

F-50158

Bennat, H., Heidrich, B., Sievers, J., **Extraction of antarctic topographic glaciological features from ERS-1 SAR data**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.141-145, ESA SP-361, 7 refs.

The suitability of ERS-1 SAR data for mapping of topographic-glaciological features is compared with information from optical data (Landsat MSS imagery) at the Hemmen Ice Rise test site, Filchner-Ronne ice shelves. Examples for the different appearance of targets imaged from ERS-1 SAR and from optical sensors are presented, offering additional and complementary information for the mapping of Antarctica. (Auth.)

F-50159

Lucchitta, B.K., Smith, C.E., Howell, J.A., Mullins, K.F., **Velocities and mass balance of Pine Island Glacier, West Antarctica, derived from ERS-1 SAR images**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.147-151, ESA SP-361, 11 refs.

The Pine Island Glacier drains a substantial area of the West Antarctic Ice Sheet. The authors calculated its average velocities—for both the grounded and floating parts of the ice stream—by tracing crevasse patterns on two sequential ERS-1 SAR images acquired in Feb. and Dec. 1992. In the floating part, the velocities are somewhat higher than those previously established from Landsat images by other workers. The authors also calculated the mass balance (net gain or loss of ice) by using their new velocity values combined with input and output parameters from previous studies. Whereas those studies yielded large positive mass balances, the present results give negative to only slightly positive balances for average input estimates. This finding is significant, because it indicates possible depletion of the Pine I. drainage basin. (Auth.)

F-50160

Fiksel, T., Hartmann, R., Winzer, W., **ERS-1 data for mapping of the Antarctic Peninsula by shape-from-shading technique**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.153-158, ESA SP-361, 7 refs.

The status of development and application of a software system for generation of topographic information from ERS-1 SAR imagery by Shape-from-Shading technique is reported. Suitability of ERS-1 SAR data for Shape-from-Shading was demonstrated at the First ERS-1 Workshop. The objective of further work was to expand the method for refining of given lower resolution Digital Elevation Models (DEM). The example of the Adelaide I. test site shows that a model with 200 m height resolution can be refined to 10 or 20 m. The DEM modified by the new technique contains many new geometric features of the Earth's surface. The created software tools are ready to be applied to the dataset of the whole area of the Antarctic Peninsula. A refined DEM and a mosaicked radar map of this area will be the result of the application. (Auth.)

F-50161

Zwally, H.J., Brenner, A.C., DiMarzio, J., Seiss, T., **Ice sheet topography from retracked ERS-1 altimetry**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.159-164, ESA SP-361, 10 refs.

An objective of the ERS-1 radar altimeter is to measure the surface topography of the polar ice sheets to a precision on the order of one meter. The authors have corrected ERS-1 Waveform Altimeter Product (WAP) data for several processing errors. They also derived a range correction from the WAP waveforms, using their multi-parameter retracking algorithm to account for range-tracking limitations inherent to radar altimetry. From crossover analysis, the resulting precision is shown to be about 2.1 m in ocean mode and 2.2 m in ice mode. A topography map, produced with 23 days of corrected data, shows details of the western part of the west antarctic ice sheet and part of the Ross ice shelf, including ice divides, ice stream boundaries, and ice shelf grounding lines. (Auth.)

F-50162

Schenke, H.W., Heidland, K., Seeber, G., Völksen, C., **Results from ERS-1 radar altimetry ground truthing on the Filchner-Ronne-Schelfeis**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.177-182, ESA SP-361, 10 refs.

For ERS-1 radar altimetry data calibration and validation, a height reference field was installed on Ronne Ice Shelf in Jan./Feb. 1992. The extent of the test field is 40 km by 40 km. Its center position was placed at the crossing point of subtracks 13 and 31 of the 3-day ice orbit. Levelling of the test field was carried out by kinematic GPS in differential mode. In addition static GSP measurements were performed on 125 points at average intervals of 3.5 km. ERS-1 altimeter height profiles were processed for the test field by using the standard ocean products of the 3-day ice orbit, of which 25 repeat measurements from Jan. to Mar. 1992 were available. Repetitive altimetry height profiles indicate maximum differences up to 4 m, probably caused by orbit errors. However, the residuals after adjustment are less than 30 cm. Results of the GPS reference heights are in good correspondence with the ellipsoidal heights from satellite altimetry. The differences from the preliminary comparison are less than 50 cm. (Auth. mod.)

F-50163

Vaughan, D.G., Frolich, R.M., Doake, C.S.M., **ERS-1 SAR: stress indicator for antarctic ice streams**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.183-186, ESA SP-361, 9 refs.

Most of the ice leaving the antarctic ice sheet passes through ice streams, seen by many glaciologists as the key components to rapid changes in an otherwise languid system. Synthetic Aperture Radar (SAR) imagery from ERS-1 is shedding new light on the dynamics of antarctic ice streams. Here, the authors combine ground measurements from Rutford Ice Stream with ERS-1 imagery and show that the primary influence on the backscatter coefficient over Rutford Ice Stream is the stress within the ice. It is concluded that increased backscatter is a result of fracture in the ice. (Auth.)

F-50164

Viehoff, T., Li, A.N., **Multi-sensor and ground-truth investiga-**

tion of Weddell Sea ice conditions, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.287-290, ESA SP-361, 2 refs.

In the western and southwestern Weddell Sea a number of small patches of relative high temperatures (-16 C to -20 C) were observed in AVHRR data between Feb. and Sep. 1992. The location and extent of these patches were nearly stationary over the entire period although the surrounding ice cover was moving. From ERS-1 SAR images acquired between Oct. 1992 and July 1992, the patches could be identified as high backscatter areas in the lee of small icebergs which did not move during the whole period. It is assumed that these bergs were grounded. A combination of SAR and AVHRR data with Argos tracked buoys shows a very homogeneous ice cover east of the Antarctic Peninsula, with strong tidal and inertial motion and with little large-scale shear activities. (Auth.)

F-50165

Saurer, H., Triebfürst, B., **Texture analysis as an aid for the evaluation of ERS-1 SAR data from a part of the Antarctic Peninsula**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.297-302, ESA SP-361, 5 refs.

Within an investigation of snow and ice dynamics in parts of the Antarctic Peninsula a method for texture analysis is developed. This method is based on a principal component analysis (PCA) of Co-occurrence matrices of ERS-1 SAR data. The result of the PCA allows a determination of different surface classes. (Auth.)

F-50166

Turner, J., Corcoran, G., Lachlan-Cope, T.A., Thomas, J.P., **Sea ice motion in the Weddell Sea, Antarctica from pairs of ERS-1 SAR images**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.303-308, ESA SP-361, 5 refs.

Pairs of ERS-1 images with a time separation of three days have been used to examine the motion of sea ice in parts of the Weddell Sea. The pair of images for Jan. 13 and 16, 1992 centered on 75S, 41W were studied in detail and ice motion vectors determined by manual tracking. A drop in surface temperature over the three days caused changes in the ice backscatter values of 3 dB, although the shapes of major floes could still be identified in both images. Over about a third of the SAR scene the shape of the ice floes changed significantly in the three day interval and it was not possible to co-register features. More frequent imagery would be needed to follow ice of this type. Although the ice motion towards the southeast as determined from the ice tracking cannot be confirmed, since no *in-situ* data is available, it is consistent with the meteorological data from a nearby coastal research station. (Auth.)

F-50167

Lehner, S., Hasselmann, K., **ERS-1 SAR observations of swell travelling into the ice**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.311-315, ESA SP-361, 8 refs.

The active microwave systems of ERS-1 provide for the first time a measurement system yielding a continuous global dataset of wind, sea state and sea ice. From synthetic aperture radar images two-dimensional wave spectra and distributions of sea ice can be derived. In a first assessment these data are used to study the wave dynamics at the ice boundary and to determine wave attenuation coefficients. Swell penetrating up to 100 km into the sea ice is observed using ERS-1 full-swath SAR images. From a series of two-dimensional image spectra the attenuation coefficient is derived and compared to other field measurements and theory. Estimates of sea ice thickness are given. Diffraction of swell by antarctic table icebergs is also studied. (Auth.)

F-50168

Roth, R., et al, **Sea-ice and climate: an approach using SAR data**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14,

1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.323-327, ESA SP-361, 20 refs.

Within the global climate system, the sea ice-covered regions of the European Arctic Ocean and of the Weddell Sea in the Atlantic sector of Antarctica are those regions where the cold bottom water of the oceans has its origin. The cold bottom water is generated when ocean water freezes beneath the Filchner-Ronne ice shelf or when sea ice is formed in the polynyas. Field data as well as theoretical considerations show that the most effective sea ice formation occurs in open water areas. The SAR data of ERS-1 offer a good opportunity to study the ice motion independent of the cloud cover, and to detect open water areas. By using SAR data, additional atmospheric data which the authors extract from the model of the European Centre For Medium-Range Weather Forecasts (ECMWF), and infrared satellite data, mean values for the energy balance of sea ice and polynyas are evaluated. (Auth.)

F-50169

Ramseier, R.O., Emmons, A., Armour, B., Garrity, C., **Fusion of ERS-1 SAR and SSM/I ice data**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.361-367, ESA SP-361, 8 refs.

SAR imagery originating from aircraft and satellites is the primary data source for ice floe tracking and mapping at the Ice Centre Environment Canada. A need exists for additional sources of information to assist in ice classification and distribution estimates. One of these is the Defence Meteorological Satellite Program's Special Sensor Microwave/Imager (SSM/I) which provides a global set of measurements of ice extent and ice classification. Emphasis has been placed on graphical merging of ERS-1 SAR and SSM/I derived ice concentration data. Results are very promising, particularly if optimum interpolation techniques are going to be used in the future. (Auth.)

F-50172

Hartl, P., Thiel, K.H., Wu, X.Q., **Information extraction from ERS-1 SAR data by means of INSAR and D-INSAR techniques in antarctic research**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.2, Paris, European Space Agency, 1994, p.697-701, ESA SP-361, 8 refs.

The antarctic ice mass has a large impact on global weather; this means there is a high interest in estimating the topography and monitoring the changes of the ice mass. The INS has studied the method of Interferometric-SAR (INSAR) in the Bonn area and is now applying this technique in the Antarctic at two different test sites. At the test site on the shelf ice where 22 corner reflectors were deployed, the topography, which is very flat, was estimated. On the second test site on Hemmen Ice Rise, Berkner I., the authors found some very interesting features due to ice movement, which need to be studied further. (Auth.)

F-50174

Wunderle, S., Gossmann, H., Saurer, H., **Snow-cover development as a component of the local geosystem on Potter Peninsula, King George Island, Antarctica**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.2, Paris, European Space Agency, 1994, p.987-991, ESA SP-361, 2 refs.

It can be shown that the snow cover dynamics in ice-free areas of Antarctica is the main key for understanding the different processes in a local geosystem. With the aid of ERS-1 SAR images it is possible to record the snow cover retreat during the time of melting. (Auth.)

F-50188

Lipenkov, V.I.A., Barkov, N.I., Martinerie, P., Raynaud, D., **Air content of ice deposits near Vostok Station** [Gazosoderzhanie ledianykh otlozhenii v raione st. Vostok], *Antarktika*, 1993, No.31, p.85-98, In Russian with English summary. Refs. p.97-98.

Seven series of total gas content (V) measurements were performed with three different analytical methods over the two deepest Vostok ice cores. Compilation and utilization of all the data from Vostok allowed the

authors to compose the first high depth resolution V profile of antarctic ice depositions down to 2546 m. As a result of depth resolution increase, short term V variability became more apparent and oscillations not longer than 100 m with amplitude up to 10% of the mean air content were observed. These rapid and large amplitude V variations cannot be explained on the basis of present relationships between total gas content of ice and ice formation conditions. Consideration of all potential sources of V variations showed that the most likely source of high frequency air content variability is nonthermal fluctuations of ice porosity Vc at closeoff depth. Therefore the well-known Vc-temperature transfer function seems to be insufficient to account for the full environmental dependence of Vc. (Auth.)

F-50197

Whillans, I.M., Van der Veen, C.J., **Patterns of calculated basal drag on Ice Streams B and C, Antarctica**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.437-446, 33 refs.

Patterns of strain rate and slope on the ice streams cannot be accounted for in the usual way as due to standing waves in ice flow over a basal obstruction to flow (such as a sticky spot). Here such features are studied using the force-budget technique. The conventional flow law is used, together with measurements of surface strain rate and shape of the glacier, to compute basal drag. The results for Ice Stream C, West Antarctica, are as expected, in that the drag varies from site to site but is directed inland, restraining the flow. The calculated drag at the base of Ice Stream B, on the other hand, is in places such that it acts to propel the glacier forward. This result is untenable. Either the conventional flow law is not applicable to Ice Stream B or there are large spatial variations in ice stiffness, perhaps associated with foliation, or both. (Auth. mod.)

F-50198

Alley, R.B., **In search of ice-stream sticky spots**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.447-454, 41 refs.

The basal shear stress of an ice stream may be supported disproportionately on localized regions or "sticky spots". The drag induced by large bedrock bumps sticking into the base of an ice stream is the most likely cause of sticky spots. Discontinuity of lubricating till can cause sticky spots, but they will collect lubricating water and therefore are unlikely to support a shear stress of more than a few tenths of a bar unless they contain abundant large bumps. Raised regions on the ice-air surface can also cause moderate increases in the shear stress supported on the bed beneath. Surveys of large-scale bed roughness would identify sticky spots caused by bedrock bumps; water-pressure measurements in regions of thin or zero till might reveal whether they were sticky spots, and strain grids across the margins of ice-surface highs would show whether the highs were causing sticky spots. Sticky spots probably are not dominant in controlling Ice Stream B near the Upstream B camp. (Auth.)

F-50199

Anandakrishnan, S., Bentley, C.R., **Micro-earthquakes beneath Ice Streams B and C, West Antarctica: observations and implications**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.455-462, 31 refs.

Micro-earthquakes have been monitored at two locations on Ice Stream B and one on Ice Stream C, West Antarctica, using a seismographic array built specifically for that purpose. Subglacial micro-earthquakes are 20 times more abundant beneath Ice Stream C than beneath Ice Stream B, despite the 100 times more rapid movement of Ice Stream B. Triangulation shows the foci beneath Ice Stream C, like those beneath Ice Stream B, to be within a few meters of the base of the ice, presumably within the uppermost part of the bed, and fault-plane analysis indicates slips on horizontal planes at about a 30 deg angle to the presumed direction of formerly active flow. Source parameters, computed from spectra of the arrivals, confirmed that the speed of slip is three orders of magnitude faster beneath Ice Stream C than beneath Ice Stream B, which means that a five orders-of-magnitude greater fraction of the velocity of Ice Stream C is contributed by the faulting, although that fraction is still small. The difference in activity beneath the two ice streams is attributed to the loss of dilatancy in the till beneath Ice Stream C in the process that led to its stagnation. (Auth. mod.)

F-50200

Harrison, W.D., Echelmeyer, K.A., Engelhardt, H., **Short-period**

observations of speed, strain and seismicity on Ice Stream B, Antarctica, *Journal of glaciology*, 1993, Vol.133(pt.3), p.463-470, 30 refs.

The speed of Ice Stream B, West Antarctica, was measured twice a day over a 1 month study period, and found to be steady at the $\pm 3\%$ level, the sensitivity of the measurements. The vertical strain was measured at three sites over a 1 year period at 1 h intervals with sensitivities of 2 or 0.2 ppm. The strain rate varied on all time-scales. Events of high strain rate were observed, but never at more than one site at a time. They can probably be understood in terms of local modification of the strain field associated with crevassing. Diurnal variation in strain rate was observed at one and possibly two sites during two summers. The seismicity was measured at all three sites, and diurnal and seasonal variations were prominent at all, the seismicity being much more intense in winter. Several possible causes of the diurnal variations in strain and seismicity are considered, including thermal and atmospheric effects and the effects of tides in the Ross Sea. (Auth.)

F-50201

Bindshadler, R.A., Vornberger, P.L., Shabtaie, S., **Detailed net mass balance of the ice plain on Ice Stream B, Antarctica: a geographic information system approach**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.471-482, 20 refs.

Field data of ice thickness, velocity and accumulation of the ice plain region of Ice Stream B, West Antarctica, are organized into a geographic information system (GIS) and used to calculate the spatial pattern of net mass balance. Overall, the ice plain is thickening at a rate of 0.13 ± 0.05 m/a. Large uncertainties of the high-resolution calculations are reduced by spatial averaging, revealing a number of areas significantly out of balance. Ice in the broad diverging flow field is mostly thinning but a thinner region of the ice plain which includes ice raft "a" is thickening. Thickening is also indicated farther downstream on the ice plain, matching the thickening already calculated to be occurring upstream of Crary Ice Rise. The patterns of net mass balance for the two major tributaries of Ice Stream B are asymmetric, demonstrating a real difference in the current dynamics of these two tributaries. (Auth.)

F-50202

Whillans, I.M., Van der Veen, C.J., **New and improved determinations of velocity of Ice Streams B and C, West Antarctica**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.483-490, 35 refs.

Measurements of velocity have been made on and next to Ice Streams B and C, West Antarctica. The results are more precise than previous work and constitute a 93% increase in the number of values. These velocities are used to describe the confluence of flow into the ice streams and the development of fast ice-stream flow. The onset of fast-streaming flow occurs in many separate tributaries that coalesce down-glacier into the major ice streams. For those inter-stream ridges that have been studied, the flow is consistent with steady state. Along Ice Stream B, gradients in longitudinal stress offer little resistance to the ice flow. The transition from basal-drag control to ice-shelf flow is achieved through reduced drag at the glacier base and increased resistance associated with lateral drag. Velocities in the trunk of Ice Stream C are nearly zero but those at the up-glacial head are similar to those at the head of Ice Stream B. (Auth.)

F-50204

Retzlaff, R., Lord, N., Bentley, C.R., **Airborne-radar studies: Ice Streams A, B, and C, West Antarctica**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.495-506, 29 refs.

Digital airborne-radar data were collected during the 1988-89 antarctic field season in 6 gridded blocks covering the upstream parts of Ice Streams A, B, and C. An automated processing procedure was developed for picking onset times, converting travel times, interpolating missing data, converting pressure-transducer readings, correcting navigational drift, performing cross-over analysis and zeroing remanent cross-over errors. Cross-over analysis was used to remove the effects of temporal variations in atmospheric pressure and to estimate errors. Interpolation between flight lines was carried out using the Kriging method. Surface elevation was referred to the Rapp Set A geoid by tying the gridded surface to satellite-surveyed ground stations, using a planar-model fit. Maps of surface elevation, ice thickness and bottom topography with standard-error estimates of 4-9 m for surface elevation and 30-60 m for ice thickness

and bottom topography were produced. These maps show that the locations of the ice streams are not clearly reflected in either the surface or basal topography, so are presumably controlled by basal or internal conditions; that there is no clearly demarcated transition zone between sheet flow and streaming flow; that there is no clear-cut evidence for the capture of the catchment of Ice Stream C by Ice Stream B, but that Ice Stream B does drain virtually the entire region between the lateral boundaries of Ice Streams A and C. (Auth.)

F-50205

Atre, S.R., Bentley, C.R., **Laterally varying basal conditions beneath Ice Streams B and C, West Antarctica**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.507-514, 26 refs.

A study of the phase of reflections of P waves off the base of Ice Streams B and C, and Ridge BC, indicates that acoustic impedances of the beds of both ice streams vary laterally. In some places the impedance is higher than in the ice (a high-impedance bed) and in some places it is less (a low-impedance bed). The estimated impedances in a dilated bed (porosity 0.4), and in a model of the lowermost ice that takes into account the relatively low P-wave speed in ice at or very near the melting point, are nearly the same. Whether the impedance in the bed is greater or less than in the ice could depend on minor changes in the nature of the sediments composing the bed, or the physical state of the bed (e.g. porosity) that could occur laterally. Lateral variations of this kind provide a ready explanation for the observations on Ice Stream B. The bed under a substantial part of Ice Stream C that exhibits a low-impedance bed also must be dilated. (Auth.)

F-50206

Merry, C.J., Whillans, I.M., **Ice-flow features on Ice Stream B, Antarctica, revealed by SPOT HRV imagery**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.515-527, 48 refs.

Numerous features of glaciological significance appear on two adjoining SPOT High Resolution Visible (HRV) images that cover the onset region of Ice Stream B, West Antarctica. Many small-scale features, such as crevasses and drift plumes, have been observed in aerial photography. Subtle large-scale features, such as long flow traces that have not been mapped previously, are clear in the satellite imagery. Newly discovered features include ladder-like runners and rungs within certain shear margins, flow traces that are parallel to ice flow, unusual crevasse patterns and flow traces originating within shear margins. (Auth.)

F-50207

Jacobel, R.W., et al, **Interpretation of radar-detected internal layer folding in West Antarctic ice streams**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.528-537, 24 refs.

Low-frequency surface-based radar-profiling experiments on Ice Streams B and C, West Antarctica, have yielded high-resolution images which depict folding of the internal layers whose detection can aid in the interpretation of ice-stream dynamics. Unlike folding seen in most earlier radar studies of ice sheets, the present structures have no relationship to bedrock topography and show tilting of their axial fold planes in the flow direction. Rather than being standing waves created by topography or local variations in basal shear stress, the data show that these folds originate upstream of the region of streaming flow and are advected into the ice streams. The mechanism for producing folds is hypothesized to be changes in the basal boundary conditions as the ice makes the transition from inland ice to ice-stream flow. Migration of this transition zone headward can then cause folds in the internal layering to be propagated down the ice streams. (Auth.)

F-50208

Bindschadler, R.A., **Siple Coast Project research of Crary Ice Rise and the mouths of Ice Streams B and C, West Antarctica: review and new perspectives**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.538-552, 46 refs.

Satellite imagery is used as a basis to review and critique the results of studies at the mouths of Ice Streams B and C and Crary Ice Rise, West Antarctica. In many cases, these past analyses are extended by taking advantage of the broad coverage within each image. New perspectives are provided by the image data and some longstanding controversies are resolved. The grounding line is easily delineated and mapped in areas cov-

ered by imagery. Extensive areas of grounded ice with complex patterns of flow stripes are identified on the flanks of Crary Ice Rise. The imagery also allows a corrected map of surface topography in the vicinity of the Downstream B camp. New questions are posed by hitherto unseen features. Data from the IGY traverse of the Ross Ice Shelf in 1957 are included to demonstrate that large changes have occurred in the past nearly 30 years in the area upstream of Crary Ice Rise. These changes include modifications in the surface topography, elimination of crevasses and increases in the ice thickness by approximately 60 m. (Auth.)

F-50209

Retzlaff, R., Bentley, C.R., **Timing of stagnation of Ice Streams C, West Antarctica, from short-pulse radar studies of buried surface crevasses**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.553-561, 22 refs.

Five short-pulse radar profiles were run across the edge of inactive Ice Stream C, one of the "Ross" ice streams that flows from the West Antarctic inland ice sheet into the Ross Ice Shelf. Scatter from buried crevasses, presumably at the surface of the ice stream when it was active, creates hyperbolae on the radar records. A density-depth curve and local accumulation rates were used to convert the picked travel times of the apices of the hyperbolae into stagnation ages for the ice stream. Stagnation ages are 130 +/- 25 years for the three profiles farthest downstream and marginally less (100 +/- 30 years) for the fourth. The profile farthest upstream shows a stagnation age of only some 30 years. These results apparently indicate a "wave" of stagnation propagating at a diminishing speed upstream from the mouth of the ice stream. The stagnation process appears to include a drop in water pressure at the bed due to a conversion from sheet flow to channelized water flow. (Auth. mod.)

F-50210

Whillans, I.M., Jackson, M., Tseng, Y.H., **Velocity pattern in a transect across Ice Stream B, Antarctica**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.562-572, 44 refs.

Repeat aerial photography is used to obtain closely spaced measurements of velocity and elevation over a complete transect of Ice Stream tributary B2, West Antarctica, including the shear margins, the fast ice of the ice stream and several unusual features, as well as the UpB camp. Persistent features, mainly crevasses, are tracked to provide 1541 values of velocity and 1933 values of elevation. These are used to describe ice flow in the ice stream. Within the ice stream, the dominant velocity gradient is lateral shear. Crevasse patterns are studied in relation to measured velocity gradients. Crevasses intersect one another at acute angles, indicating that their origin is deeper than the depth to which crevasses penetrate. One feature within the ice stream seems to be a raft of stiff ice; others are crevasse trains. Also, there are spreading ridges, perhaps due to upwelling ice. There is no evidence of large sticky spots within the studied transect, i.e. no steep surface slopes with associated surface stretching just up-glacier and surface compression down-glacier. (Auth.)

F-50211

Femenias, P., Rémy, F., Raizonville, R., Minster, J.F., **Analysis of satellite-altimeter height measurements above continental ice sheets**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.591-600, 23 refs.

In order to estimate the accuracy of altimetric height measurements over ice sheets, and using a section of the antarctic ice sheet for analysis, an altimeter waveform simulator has been developed, and different tracking methods have been tested. A large range of surface features, including large-scale and medium-scale features and micro-roughness have been taken into account for modeling of either surface- or volume-scattering. A large set of parameters affects the trailing edge of the radar waveform, so that re-tracking algorithms based on the detection of its leading edge provide better retrievals of the surface height than those based on the analysis of the whole waveform. A volume component is clearly present in the radar waveforms; its effect on the leading edge depends mostly on the snow grain-size (and therefore on the snow temperature) and on the pointing angle. However, on average, the induced error in snow-surface height estimation should only be around 25 cm. (Auth. mod.)

F-50212

Hall, A., Weston, K., **Interaction between an ice sheet and its**

atmospheric boundary layer, *Journal of glaciology*, 1993, Vol.133(pt.3), p.601-608, 27 refs.

The importance of the atmospheric boundary layer for the coupling between the climate and an ice sheet is investigated, using a slab model of the atmospheric boundary layer. The model is shown to give reasonable agreement with observations over Antarctica and is used to look at the effect of different ice-sheet shapes on the boundary layer. The importance of entrainment in bringing heat to the surface is highlighted and is shown to be particularly significant when the ice profile becomes steeper. The model could be used as part of an energy-balance model of snow in order to incorporate the interplay of the boundary layer and ice-sheet shape in the ablation process. The slab model could also be used in a GCM as a parameterization of these sub-grid scale processes which are at present ignored in models on a global scale. (Auth.)

F-50213

Ridley, J.K., Cudlip, W., Laxon, S.W., **Identification of subglacial lakes using ERS-1 radar altimeter**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.625-634, 24 refs.

Radar altimeter data from ERS-1 allowed detailed topographic mapping of Antarctica to 82S to be carried out, revealing several notable surface features. Among these is the large subglacial lake near Vostok which is mapped here in detail. The central part of the lake is found to have an exceptionally smooth surface with r.m.s. elevation variations of less than 0.2 m. A search for other large antarctic lakes in the data is made based on the smoothness and low gradient of the surface. A number of other flat areas are identified with lake locations previously determined from radio-echo sounding observations. However, radar altimeter observations show that minimum lake size of 20 km is required for a surface above a lake to become flat. Numerous bowl-like features can be seen in the surface topography, and these may be associated with intermediate-sized subglacial lakes. It is determined that high spatial-resolution radar altimetry could be used to identify subglacial lakes greater than 10 km in lateral extent. Flat regions of the ice sheet are particularly useful as they may be used as height-reference surfaces to help fix the orbits of radar altimeter satellites. (Auth.)

F-50214

Davis, C.H., Moore, R.K., **Combined surface- and volume-scattering model for ice-sheet radar altimetry**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.675-686, 59 refs.

Over the last 15 years, satellite altimeter data have been used to produce surface-elevation maps of the Greenland and antarctic ice sheets with a 2 m accuracy. Recent work has shown that altimeter waveforms over higher-altitude regions of the ice sheets are affected by subsurface volume-scattering. Here a theoretical model is developed for altimeter return waveforms over the ice sheets that is based on a combination of surface- and volume-scattering. By approximating the altimeter's antenna pattern and transmitted pulse shape with Gaussian functions, a closed-form analytical solution for the return-power volume-scattered from beneath the ice-sheet surface is derived. The volume-scattering model is combined with the Brown model and applied to average waveforms from the Greenland and antarctic ice sheets. The results show that the combined model accurately describes variations in altimeter waveform shapes that are produced by differing contributions of surface- and volume-scattering to the received power. The combined model is then used to simulate return waveforms from a dual-frequency altimeter. The simulation shows that a two-frequency system can provide quantitative estimates of the absorption and scattering coefficients for near-surface snow. (Auth. mod.)

F-50215

Davis, C.H., Zwally, H.J., **Geographic and seasonal variations in the surface properties of the ice sheets by satellite-radar altimetry**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.687-697, 31 refs.

Geosat-altimeter waveforms from the Greenland and antarctic ice sheets are analyzed using an algorithm based upon a combined surface- and volume-scattering model. The results demonstrate that subsurface volume-scattering occurs over major parts of the ice sheets. Quantitative estimates of geographic variations in the near-surface ice-sheet properties are derived by retracking individual altimeter waveforms. The derived surface properties correlate with elevation, latitude and microwave brightness-temperature data. The extinction coefficient of snow obtained by this

method varies from 0.48 to 0.13/m over the latitudes from 65 to 72N on the central part of the Greenland ice sheet and from 0.20 to 0.10/m over a section of Wilkes Land in East Antarctica where the elevation increases from 2550 to 3150 m. Larger snow grain sizes occur at lower elevations of the ice sheet because of higher mean annual temperatures. The larger grain sizes increase the extinction coefficient of snow and decrease the emitted energy (brightness temperature) from greater snow depths. The passive microwave data are also used to determine the average number of melt d/year (1979-87) for the central part of the Greenland ice sheet. For latitudes from 65 to 68.5N, the average number of melt days decreases from 3.5 to 0.25 d/year, whereas no melt events are observed for latitudes above 69N over the 8 year period. Snow subjected to alternate melting and freezing has enhanced grain sizes compared to that of dry snow. This accounts for the larger values and larger spatial variations of the extinction coefficient of snow on the Greenland ice sheet compared to East Antarctica, where surface temperatures are never high enough to cause surface melting. (Auth. mod.)

F-50216

Moore, J., **Ice blisters and ice dolines**, *Journal of glaciology*, 1993, Vol.133(pt.3), p.714-716, 18 refs.

This letter reviews the distribution of ice dolines, features similar to but larger than ice blisters, on the surface of antarctic ice shelves and discusses their structure and evolution.

F-50219

Anderson, I., **Antarctic career move for ageing torpedo**, *New scientist*, Mar. 27, 1993, 137(1866), p.19.

Australian scientists are adapting a torpedo for use as a sonar platform for under-ice sounding of sea ice thickness in Antarctica. Tests are currently being conducted on a prototype.

F-50227

Hambrey, M.J., **Structure and dynamics of the Lambert Glacier-Amery Ice Shelf system: implications for the origin of Prydz Bay sediments**, *Proceedings of the Ocean Drilling Program*, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.61-75, 30 refs.

DLC QE39.T49b

Depositional processes in Prydz Bay during the past 40 m.y. or so have been strongly influenced by glacier ice. Therefore, to understand these processes better, and to define the source areas of the sediment, it is necessary to determine the role of the different ice masses entering the bay. Ice thickness, topography, and ice velocity data indicate that the Lambert Glacier-Amery Ice Shelf system is one of the most important routes for the discharge of ice from the East Antarctic Ice Sheet, and in the past has been the dominant influence on sedimentation in Prydz Bay. Most of the flow is concentrated through the Lambert Graben, which has been overdeepened to a depth of 2500 m below sea level. Glaciological work has indicated that close to the grounding line there is considerable melting, but from a short distance seaward of this position, basal freeze-on of ice of oceanic origin occurs. Thus nearly all the basal debris load in the Lambert Glacier system may be deposited close to the grounding line, and there is probably negligible deposition beneath the major part of the Amery Ice Shelf. Englacial debris, delivered to the open sea through the interior of the ice shelf, will be deposited from icebergs. (Auth. mod.)

F-50293

Fily, M., Benoist, J.P., **Large scale study of the microwave signature of the antarctic ice sheet**, *International Colloquium on Physical Measurements and Signatures in Remote Sensing*, 5th, Courchevel, France, Jan. 14-18, 1991. Vol.1. ESA SP-319, Noordwijk, Netherlands, European Space Agency, 1991, p.347-350, N92-11463, 11 refs.

Data from the Scanning Multichannel Microwave Radiometer are analyzed over the antarctic ice sheet. A principal component analysis reveals the importance of the polarization difference at 6.6 GHz and of the gradient between 6.6 and 18 GHz brightness temperatures. Distinct areas appear from the spatial distribution of these parameters. Differences are related to surface snow characteristics as stratification, due to a distinct temperature-snow accumulation ratio. Temporal variations throughout

one year are used to derive a map related to the topography. The analysis of data over seven years indicates a remarkable stability without any particular long term trend. (Auth.)

F-50294

Surdyk, S., Fily, M., **Comparison between the observed microwave spectral signatures over the antarctic ice sheet and a snow emissivity model**, International Colloquium on Physical Measurements and Signatures in Remote Sensing, 5th, Courchevel, France, Jan. 14-18, 1991. Vol.1. ESA SP-319, Noordwijk, Netherlands, European Space Agency, 1991, p.351-354, N92-11464, 8 refs.

The Scanning Multichannel Microwave Radiometer data are compared with the snow characteristics measured during a Japanese traverse made in 1968-1969 from Showa Station to the South Pole on the antarctic ice sheet. The results from a snow emissivity model based on strong-fluctuation theory are used to help with the interpretation of data. The polarization difference is mainly affected by the stratification of snow where its density is low. The brightness temperature versus frequency gradient is linked to the distribution of grain sizes as determined from detailed stratigraphies. (Auth.)

F-50305

Van Ypersele, J.P., **Sea-ice interactions in polar regions**, NATO Advanced Study Institute on Energy and Water Cycle in the Climate System, Glücksburg, Germany, Sep. 30-Oct. 11, 1991. Proceedings. Edited by E. Raschke et al and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.5, Berlin, Springer-Verlag, 1993, p.295-322, Refs. p.316-322.

DLC QC880.E46

This paper reviews the state of knowledge about ocean and sea-ice interactions, their role in the climate system and their modelling. It is meant as an introduction to sea-ice geophysics for researchers with an interest in polar phenomena, and not as an exhaustive review for specialists. Included is a description of the basic properties of sea ice at the microscopic scale, starting with the processes governing its formation, then its thermodynamic and mechanical properties; the brine rejection by sea ice, which has such a large influence on the stability of the ocean mixed layer; and sea-ice behavior at the macroscopic scale. (Auth. mod.)

F-50331

Kovacs, A., Gow, A.J., Morey, R.M., **Reassessment of the in-situ dielectric constant of polar firn**, U.S. Army Cold Regions Research and Engineering Laboratory. Report, Dec. 1993, 22p., ADA-276 999, 39 refs.

The success in using VHF and UHF frequency systems for sounding polar ice sheets has been tempered by an uncertainty in the *in situ* dielectric constant, which controls the effective velocity of an electromagnetic wave propagating in an air-ice mixture. An empirical equation for determining dielectric constant vs. density (specific gravity, ρ) was proposed in 1968 by Robin et al. where dielectric constant = $(1+0.851 \rho)^2$. However, this expression has met with uncertainty because wide-angle radar refraction sounding techniques have produced values of dielectric constant that are lower than Robin's equation predicts. This report discusses radar soundings made on the McMurdo Ice Shelf and compares the resulting dielectric constant values with Robin's equation, laboratory measurements on firn and ice, and other expressions given in the literature for determining dielectric constant vs. the specific gravity of dry firn and ice. The findings indicate that the form of Robin's equation is valid. However, the analysis also indicates the expression could be slightly improved to read dielectric constant = $(1+0.845 \rho)^2$. Reasons are suggested as to why previous wide-angle radar sounding studies did not reproduce Robin's findings. (Auth.)

F-50344

Morris, K., Jeffries, M.O., **Ice thickness variability of the McMurdo Sound landfast ice runway**, *Antarctic journal of the United States*, 1992, 27(5), p.83-85, 4 refs.

Every year an ice runway is prepared on the landfast ice of McMurdo Sound. The mean ice thickness along the runway and its standard deviation were calculated for each set of measurements made on a given day for

each year. A plot of mean ice thickness versus time shows the ice thickness increasing during the life of the runway each year. The 1989 data are unusual compared to the other data sets, as they suggest fluctuations in the ice thickness. This is most likely a measuring error and not an actual ice phenomenon. During the course of the sampling programs, the ice thickness increased by 0.57 m in 1989; 0.6 m (main runway) and 0.26 m (cross-wind runway) in 1990; and 0.56 m in 1991. The maximum mean ice thickness was generally attained in early Dec., with values of 2.28 m (1989), 2.34 m (1990), 2.27 m (cross wind runway), and 2.22 m (1991). Thus, the amount of ice grown during the operation of the runways was approximately 25% of the maximum ice thickness (except for the cross-wind runway, which operated for a shorter period of time at the end of the season).

F-50345

Danielson, A., Jeffries, M.O., **Small-scale variability of physical properties and structural characteristics of a single ice floe**, *Antarctic journal of the United States*, 1992, 27(5), p.85-87, 9 refs.

This study focuses on small-scale variations of snow depth, ice thickness, structure-stratigraphy, temperature, and salinity of ice cores from an ice floe located 1 km south of the Drygalski Ice Tongue in the western Ross Sea, in Jan. 1992. The structure-stratigraphy of the cores, which are comprised almost entirely of frazil ice, indicates that individual floes can have a fairly uniform growth pattern when the growth conditions do not vary throughout the growth season. This structural uniformity may account for the general similarity of the physical properties and ice thickness within the floe over distances as great as 50 m. Despite ice temperatures close to the melting point, the ice retains a significant amount of brine, particularly in the basal layers.

F-50346

Ackley, S.F., Gow, A.J., Lytle, V.I., Yankielun, N.E., Darling, M.N., **Sea-ice investigations on Nathaniel B. Palmer: Cruise 92-2**, *Antarctic journal of the United States*, 1992, 27(5), p.87-88, 9 refs.

Preliminary results of studies made on sea ice in the western Weddell Sea in May and June of 1992 aboard the vessel *Nathaniel B. Palmer* are presented. The principal objective was to obtain some regional depiction of the ice properties and processes over several scales, from microstructural properties to the variability of ice types, over the length of the track. The vessel stopped for a total of 14 full ice stations and 1 coring station. A complete ice station consisted of the collection of four cores; snow-pit studies in which physical property measurements were made of the snow; snow surface elevation surveys; and radar backscatter investigations of snow thickness and snow/ice interface characteristics.

F-50347

Gow, A.J., Ackley, S.F., Lytle, V.I., Bell, D., **Ice-core studies in the western Weddell Sea (Nathaniel B. Palmer 92-2)**, *Antarctic journal of the United States*, 1992, 27(5), p.89-90, 4 refs.

In this report the authors give examples of the physical properties of the ice cores obtained in the western Weddell Sea and compare them to previous work in the area. Ice stations were occupied while transiting from the ice edge to the Ice Station Weddell 1 and during the return trip to the ice edge (May 21 to June 22, 1992). A total of 15 stations were made, including two stations where first-year lead ice was sampled in addition to the thicker ice next to the ship. A plot of bulk salinities versus ice thickness at the 15 sampling sites is shown. In general, the salinities are highest in the thinner ice types. On the basis of observations made, three main kinds of ice were encountered: young ice (less than 60 cm thick) that had formed during the current winter season; ice that had formed in the 1991 winter and had survived the 1991-1992 summer; and older, thicker ice that had persisted through two separate winters and was entering a third winter.

F-50348

Darling, M.N., Lytle, V.I., Ackley, S.F., **Ice observations in the western Weddell Sea (Nathaniel B. Palmer 92.2)**, *Antarctic journal of the United States*, 1992, 27(5), p.91-93, 5 refs.

During May-June 1992, the *Nathaniel B. Palmer* made 4 traverses of the western Weddell Sea in conjunction with operations on Ice Station Weddell 1. The method of recording observations was consistent throughout the project. An observer noted the ship position and surrounding ice

conditions every hour using a numerical scheme. Categories noted were: total ice concentration, percent concentration of ice types, floe size, topography, snow type, and open water characteristics. Ice thickness and snow thickness were also estimated. These observations differ from those made during the U.S.-U.S.S.R. Weddell Polynya expedition in 1981 in which the pack-ice zone was divided into 3 distinct regions delineated by wave action and swell propagation. Although the outbound leg of the rotation cruise passed through four distinct regions, they differed from those observed in 1981 in terms of both observed characteristics and the processes by which they were formed.

F-50349

Lytle, V.I., Ackley, S.F., **Snow properties and surface-elevation profiles in the western Weddell Sea, (Nathaniel B. Palmer 92-2), *Antarctic journal of the United States*, 1992, 27(5), p.93-94., 10 refs.**

During the Weddell Sea Cruise of the *Nathaniel B. Palmer* in May and June 1992, 15 ice stations were occupied. At most of these stations ice cores were collected, surface snow and ice elevation lines were measured, and snow characterization was performed. Two 100 m surface elevation lines at each station were measured. They were positioned at right angles to each other; measurements of the snow thickness, and the ice and snow elevations above sea level were collected at 0.5 m spacing. In addition, ice thickness holes were drilled and measured along these same lines at about 10 m spacing. A total of 22 surface elevation lines were measured. These measurements, which were taken during the austral winter, did not in general show the significant below-sea-level portions that were seen both on the Ice Station during this year's austral fall and in data taken in austral spring.

F-50350

Yankielun, N.E., Ackley, S.F., **Millimeter-wave radar backscatter measurements over Weddell Sea pack-ice (Nathaniel B. Palmer 92-2), *Antarctic journal of the United States*, 1992, 27(5), p.95-96, 3 refs.**

The research vessel R/V *Nathaniel B. Palmer* traversed the Weddell Sea during May and June 1992. At 15 ice stations along the route, a Ka band (35 GHz) radar was used to measure backscatter from the snowcover and underlying sea-ice surface. The authors' objective is to understand the interaction of electromagnetic radiation with the snow and sea ice in this region for better interpretation of geophysical parameters from aircraft, spaceborne radars, and radiometers at microwave frequencies. Detailed snow and ice physical property observations were performed, including characterization of snow and ice surface roughness, salinity, density, grain size, and snow stratigraphy.

F-50351

Gordon, A.L., Lukin, V.V., **Ice Station Weddell 1, *Antarctic journal of the United States*, 1992, 27(5), p.97-99, 1 ref.**

An account is given of the deployment and activities of a scientific station on a drifting ice floe to gather extensive observations in the western Weddell Sea. In 1988, the concept for the U.S./Russian Ice Station Weddell 1 (ISW) was initiated, with detailed planning in 1989-1991 and field deployment in 1992. The science program spanned many disciplines, including measurements of full water-column thermohaline and tracer fields; current measurements; estimations of turbulent fluxes within the oceanic and atmospheric planetary boundary layers; sea-ice physical, chemical, and biological characteristics; sea-ice dynamics; and water-column biology.

F-50358

Ackley, S.F., Lytle, V.I., **Sea-ice investigations on Ice Station Weddell 1: II. Ice thermodynamics, *Antarctic journal of the United States*, 1992, 27(5), p.109-110, 6 refs.**

The objective of the thermodynamics measurement program was to identify mass balance of the sea ice over the western Weddell Sea. The authors measured the net ice growth or decay in the region of the ice station's drift and attempted to identify the individual or combination of processes responsible for those changes in the ice cover. Thermistor strings imbedded within the ice and snow covers were used to measure the heat flux between the ocean and atmosphere. Results indicate that top-surface ice growth is one of the major ice-growth processes for this region,

because the old ice cover dominates the areal coverage and the thermistor data show little growth associated with bottom freezing processes in this ice.

F-50359

Ackley, S.F., Elder, B., Lytle, V.I., Bell, D., **Sea-ice investigations on Ice Station Weddell 1: I. Ice dynamics, *Antarctic journal of the United States*, 1992, 27(5), p.111-113, 7 refs.**

Several components of the sea-ice dynamics measurement program that was conducted on Ice Station Weddell 1 (ISW) from Feb. to June 1992 are reported. The objective of the dynamics measurement program was to identify how the sea-ice thickness distribution is affected by the deformational activity of the ice cover. Stress measurements within the ice cover relate the external forces to the deformational or rheological processes within the ice cover. Stress sensors, usually characterized as hard sensors because they are housed in a steel case of a high modulus of elasticity compared with the surrounding ice, were installed at 4 sites of differing ice type located at the camp floe. A preliminary look at the data, along with the visual field observations, generally shows that the stress field is highly episodic, with short bursts of high activity over minutes separated by hours or by days of little or no stress measured. Examples of the stress field resulting from several deformational processes were obtained, including tension cracking and rafting, buckling in thin ice, cracking resulting from pressure ridge edge loading, compressional ridge formation, and shear ridge formation in thicker ice.

F-50381

Crocker, G.B., **Physical processes in antarctic landfast sea ice, Cambridge, U.K., Cambridge University, 1988, 211p., Ph.D. thesis. Refs. p.194-211.**

Variations in the basic physical properties, thermodynamics, and wave dynamics of an antarctic fast ice sheet were studied over the course of an austral winter. The field observations, which were made at McMurdo Sound between Apr. and Oct. 1986, included measurements of ice thickness, salinity, temperature, crystal structure, and snow depth and density. A micro-meteorological instrument package on the ice enabled calculations of the energy fluxes controlling ice growth, and analyses of the applicability of arctic thermodynamic ice growth models to the antarctic environment. Observations showed that little or no ocean swell reaches the fast ice cover during the winter, but that considerable wave activity results from the direct action of wind blowing across the ice surface. The thermodynamics and wave dynamics studies are then combined with the physical properties measurements in a theoretical analysis of the processes controlling the destruction of antarctic fast ice sheets. The calculations show that there are two primary sources of breakup: propagating swell which is dominant during a brief period in late summer, and wind stress which is responsible for most mid-winter breakouts. The similarities and differences between the ice observed in McMurdo Sound and fast ice in other parts of the Antarctic, and more generally, between antarctic and arctic fast ice sheets, are discussed. (Auth. mod.)

F-50400

Zagorodnov, V.S., et al, **Hydrophilic liquid in glacier boreholes, *Cold regions science and technology*, Mar. 1994, 22(3), p.243-251, 23 refs.**

Antifreeze solutions based on ethanol and other high molecular weight alcohols are among several potential fluids used for drilling deep holes in arctic and antarctic glaciers. At relatively high ice temperatures in boreholes, the concentration of ethanol in the solution can be low. Therefore, using such drilling fluids causes less environmental impact. Ethanol-water solutions (EWS) have been used for filling boreholes at various temperatures from 0 to -58 C. Ethanol requirements for deep drilling are significantly less than the volume of the borehole. Under normal operating conditions, ice core dissolution is about 1 mm ply per 40 min. Use of EWS for thermal drilling leads to slush formation. However, experience has shown that this is not a major drilling problem. The lifetimes of the boreholes in central Antarctica are one year or more. (Auth. mod.)

F-50401

Van de Wal, R.S.W., et al, **From $^{14}\text{C}/^{12}\text{C}$ measurements towards radiocarbon dating of ice, *Tellus*, Apr. 1994, 46B(2), p.94-102, 12 refs.**

A dry extraction method of CO₂ included in glacier ice adds a contamination equivalent to 1.8 microg modern carbon for a 35 microg C sample. This enables radiocarbon dating by accelerator mass spectrometry of 35 microg C samples to about 25,000 bp. Measured ¹⁴C/¹²C ratios are presented for a part of the Vostok ice core, and for some surface samples; high ¹⁴C/¹²C values ranging between 65 and 105 pm C indicate *in-situ* ¹⁴C production during the ablation. The reproducibility of radiocarbon dating of ice is demonstrated by results for some parts of the Caroline core, yielding an age versus depth profile in which the age does not increase simply with depth. The results indicate that the accuracy of radiocarbon dating of ice is limited not by the statistical error arising in the accelerator measurements, but by the uncertainty in the contamination background of the samples and by the *in-situ* production of ¹⁴C. (Auth. mod.)

F-50402

Cunningham, J., Waddington, E.D., **Air flow and dry deposition of non-sea salt sulfate in polar firn: paleoclimatic implications, *Atmospheric environment***, Dec. 1993, 27A(17-18), p.2943-2956, 38 refs.

Non-sea salt sulfate aerosol (NSS) is an important factor for the Earth's albedo because it backscatters solar radiation and is the major cloud condensation nucleus over oceans. At Vostok, NSS concentration shows an increase in glacial period ice of 20-46% that cannot be attributed to changes in accumulation rate. The additional NSS may be due to enhanced dry deposition by topographic windpumping during the windy glacial periods. Presented here is a mathematical model of the volume flux of air into snow due to barometric pressure changes and air flow over surface microrelief. The Gormley-Kennedy equation approximately describes how aerosols advected into the snow pack are removed from the air by diffusion to the snow matrix. Barometric pressure and wind speed data from several polar sites have been used to quantify the vertical volume flux of air and mass flux of NSS. Model results indicate that air flow over small sastrugi is the dominant dry deposition mechanism for NSS. Paleo wind speed and surface roughness can significantly influence the aerosol record in ice cores. (Auth. mod.)

F-50423

Craig, H., Shoji, H., Langway, C.C., Jr., **Nonequilibrium air clathrate hydrates in antarctic ice: a paleopiezometer for polar ice caps, *National Academy of Sciences. Proceedings***, Dec. 1993, 90(13), p.11,416-11,418, 14 refs.

"Craigite," the mixed-air clathrate hydrate found in polar ice caps below the depth of air-bubble stability, is a clathrate mixed crystal of approximate composition (N₂O₂)·6H₂O. Recent observations on the Byrd Station core show that the air hydrate is present at a depth of 727 m, well above the predicted depth for the onset of hydrate stability. It is proposed that the air hydrate occurs some 100 m above the equilibrium phase boundary at Byrd Station because of "piezometry"—i.e., that the anomalous depth of hydrate occurrence is a relic of a previous greater equilibrium depth along the flow trajectory, followed by vertical advection of ice through the local phase-boundary depth. Flowline trajectories in the ice based on numerical models show that the required vertical displacement does indeed occur just upstream of Byrd Station. Air-hydrate piezometry can thus be used as a general parameter to study the details of ice flow in polar ice caps and the metastable persistence of the clathrate phase in regions of upwelling blue ice. (Auth.)

F-50531

Eicken, H., Lange, M.A., Hubberten, H.W., Wadhams, P., **Characteristics and distribution patterns of snow and meteoric ice in the Weddell Sea and their contribution to the mass balance of sea ice, *Annales geophysicae***, Feb. 1994, 12(1), p.80-93, 62 refs.

Based on snow- and ice-thickness measurements at >11,000 points augmented by snow- and ice-core studies during 4 expeditions from 1986-92 in the Weddell Sea, the authors describe characteristics and distribution patterns of snow and meteoric ice and assess their importance for the mass balance of sea ice. For first-year ice (FY) in the central and eastern Weddell Sea, mean snow depth amounts to 0.16 m (mean ice thickness 0.75 m) compared to 0.53 m (mean ice thickness 1.70 m) for second-year ice (SY) in the northwestern Weddell Sea. Ridged ice retains a thicker snow cover than level ice, with ice thickness and snow depth negatively correlated for

the latter, most likely due to aeolian redistribution. With a mean density of 290 kg/m³, the snow cover itself contributes 8% to total ice mass (7% FY, 11% SY). Analysis of $\delta^{18}\text{O}$ in snow indicates a local maximum in accumulation in the 65 to 75S latitude zone. Hydrogen peroxide in the snow has proven useful as a temporal tracer and for identification of second-year floes. Drawing on accumulation data from stations at the Weddell Sea coast, it becomes clear that the onset of ice growth is important for the evolution of ice thickness and the interaction between ice and snow. Loss of snow to leads due to wind drift may be considerable, yet is reduced owing to metamorphic processes in the snow column. This is confirmed by a comparison of accumulation data from coastal stations and from snow depths over sea ice. Temporal and spatial accumulation patterns of snow are shown to be important in controlling the sea-ice cover evolution. (Auth. mod.)

F-50532

Whillans, I.M., Van der Veen, C.J., **Controls on changes in the West Antarctic ice sheet, NATO Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.47-54, 10 refs.**

The United States National Science Foundation has been supporting field and theoretical programs to assess the present-day mass balance of the Ross Sea sector of the West Antarctic Ice Sheet, to determine if the ice streams exist and are important, and to investigate the controls on the future course of the ice sheet. The present contribution contains a summary of some of the results of that work and interpretations for the causes of the measured mass imbalances. (Auth. mod.)

F-50533

Genthon, C., **Observations and simulations of temperature and ice accumulation at the surface of Antarctica, NATO Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.117-130, 12 refs.**

Surface temperature and ice accumulation are the most important boundary parameters of an ice sheet at its interface with the atmosphere. However, over the large polar ice caps, observation of these parameters is sparse and not reliable. This is a limitation to studying the current mass balance of the ice sheets. It is also a major obstacle to calibrating and validating models of the polar atmosphere necessary for any attempt to simulate the evolution of an ice sheet under climate conditions different from the present. This paper synthesizes the primary difficulties in obtaining an accurate climatological model of antarctic ice sheet surface conditions, including surface temperature and ice accumulation. (Auth. mod.)

F-50535

Meier, M.F., **Ice, climate, and sea level; do we know what is happening, NATO Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.141-160, Refs. p.156-160.**

Sea level is currently rising at about 2 mm/a. The cause of this rise has been analyzed by several authors (e.g., Thorarinsson, 1940; Gornitz et al, 1982; Barnett, 1983; NRC, 1985; Robin, 1986; Warrick and Oerlemans, 1990; Meier, 1990a). However, estimates of the individual components do not, in general, add up the observed sea-level rise. Yet the scientific community is being asked to make predictions about future sea-level rise, and predictions are being made. How confident can these predictions be, given the incomplete knowledge of the present condition? The purpose of this paper is to examine the current understanding of the processes that are contributing to present sea-level rise, how they might be expected to change in the future, and what the implications of these changes might be for other processes involved in the total earth system. The mass balance of the antarctic ice sheet is a principal object of study. (Auth. mod.)

F-50540

Waddington, E.D., Morse, D.L., Grootes, P.M., Steig, E.J., **Connection between ice dynamics and paleoclimate from ice cores: a study of Taylor Dome, Antarctica**, NATO Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.499-516, 26 refs.

Ice sheets and glaciers form a major component of the global climate system. Changes in the configuration of the ice sheets can change global circulation patterns. Conversely, changing patterns of temperature and precipitation can alter the size and shape of the ice sheets. The dynamical behavior of the ice sheets must be understood if global change on time scales of centuries to millennia are to be understood. Ice core paleoclimate studies and ice dynamics research are also interdependent. This paper outlines this interdependence and describes a combined ice dynamics and ice core paleoclimate study being conducted in the McMurdo Sound region of Antarctica. (Auth. mod.)

F-50543

Oberhuber, J.M., Holland, D.M., Mysak, L.A., **Thermodynamic-dynamic snow sea-ice model**, NATO Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.653-673, 12 refs.

Oberhuber (1992) presented a thermodynamic-dynamic sea-ice model coupled to a global ocean general circulation model. In the present paper the addition of a snow model is described. A prognostic equation for snow thickness is presented which is forced by snowfall, snowmelt, snow aging, and the flooding of sea ice. Additionally, the total snow-ice heat content is computed. Simulations indicate an asymmetric behavior of the model arctic and antarctic regions. In the Antarctic, it is important to have snow cover to get a reasonable sea-ice simulation. However, in the arctic snow cover is less important, but the heat content there plays an important role in the sea-ice simulation. (Auth. mod.)

F-50578

Qin, D., ed, **Glaciological data in the region of the Great Wall Station, Antarctica from Dec. 1985 to Feb. 1989, CHINARE data report**, Dec. 1993, No.5, 118p., In English and Chinese. 6 refs.

This report summarizes glaciological studies carried out on Nelson I. and in the vicinity of the Great Wall Station prior to, and during, the 1989 Chinese Antarctic Expedition. The discussion, with data presented in diagrams, charts and tables, covers glacier surface velocity and strain, ice thickness measurements from radar soundings, bedrock topography, ice mass balance and formation, ice core analysis, snow accumulation, density and temperature, and sea ice observations. A map of Nelson I. on a 1:50000 scale is included.

F-50584

Bender, M.L., Sowers, T., Barnola, J.M., Chappellaz, J., **Changes in the O_2/N_2 ratio of the atmosphere during recent decades reflected in the composition of air in the firn at Vostok Station, Antarctica**, *Geophysical research letters*, Feb. 1, 1994, 21(3), p.189-192, 16 refs.

Samples of air at various depths in firn were collected at Vostok Station and analyzed for $\delta^{15}N$ of N_2 , O_2/N_2 ratio, and CO_2 . The ultimate objective of this work is to constrain the recent rate of the atmospheric $[O_2]$ decrease, thereby providing a direct experimental constraint on net CO_2 fluxes into the ocean and the land biosphere. $\delta^{15}N$ increases with depth, because of gravitational enrichment, at approximately the rate predicted by the barometric equation. Gravitationally corrected CO_2 decreases with depth to 308 ppmV at 101.9 m depth, because deeper air is older and less contaminated with anthropogenic CO_2 . The gravitationally corrected O_2/N_2 ratio increases with depth mainly because burning fossil fuel consumes O_2 . Samples in the top 20 m of the firn have anomalously high CO_2 concentrations and anomalously low O_2/N_2 ratios. Samples below 96.2 m depth have anomalously high O_2/N_2 ratios. Between 30 and

96.2 m depth, the gravitationally corrected increase in the O_2/N_2 ratio is nearly equal to that computed from the rate of O_2 consumption by combustion of fossil fuels. The results indicate that the rate of anthropogenic O_2 consumption can be accurately constrained by future firn air studies. (Auth.)

F-50606

Frankenstein, S., Shen, H.H., **Effect of waves on pancake ice collisions**, International Offshore and Polar Engineering Conference, 3rd, Singapore, June 6-11, 1993. Proceedings. Vol.2. Edited by J.S. Chung, K. Karal, M.S. Triantafyllou, and R.W. Frederking, Golden, CO, International Society of Offshore and Polar Engineers (ISOPE), 1993, p.712-717, 10 refs.

DLC TC1665.I579

This study addresses a phenomenon that was observed in the 1986 Winter Weddell Sea Project. A rapid growth of the ice cover in a wave field was reported. The ice cover in that part of the Marginal Ice Zone of the southern ocean was later found to be formed by the freezing of pancake ice. A model which describes the above process has been proposed. This model yields the differential drift caused by the wave motion and demonstrates that floe collisions can be produced by waves. Under freezing condition, such collisions can enhance the growth of an ice cover by welding together neighboring pancake ice floes. In this paper, the model is analyzed to study a broad range of wave and floe parameters. The resulting drift velocity and floe collision frequency are quantified for various floe and wave properties. Results from this analysis in general agree with the few available field observations. (Auth.)

F-50628

Grenfell, T.C., et al, **Passive microwave observations of the Weddell Sea during austral winter and early spring**, *Journal of geophysical research*, May 15, 1994, 99(C5), p.9,995-10,010, 34 refs.

The results of multispectral passive microwave observations (6.7 to 90 GHz) are presented from the cruises of the FS *Polarstern* in the Weddell Sea from July to Dec. 1986. This paper includes primarily the analysis of radiometric observations taken at ice station sites. Averaged emissivity spectra for first-year (FY) ice were relatively constant throughout the experiment and were not statistically different from FY ice signatures in the Arctic. Detailed ice characterization was carried out at each site to compare the microwave signatures of the ice with the physical properties. Absorption optical depths of FY ice were found to be sufficiently high that only the structure in the upper portions of the ice contributed significantly to interstation emissivity variations. Emissivity spectra are presented for a range of thin ice types. Unsupervised principal component analysis produced three significant eigenvectors and showed four different surface types: open water, thin ice, FY ice, and FY ice with a thick snow cover. A comparison with SMMR satellite data showed that averaged ice concentrations derived from the ship's ice watch log were consistent with the satellite concentrations. The surface-based emissivities for FY ice were also compared with emissivities calculated from scanning multichannel microwave radiometer (SMMR) satellite radiances. Best agreement was found at 6.7 and 10 GHz, while at 18 and 37 GHz, SMMR emissivities were slightly lower than surface based results. For the three lower frequencies agreement was found within a confidence limit of 95% and for 37 GHz within about 90%. (Auth. mod.)

F-50629

Zabel, I.H.H., Jezek, K.C., **Consistency in long-term observations of oceans and ice from space**, *Journal of geophysical research*, May 15, 1994, 99(C5), p.10,109-10,120, 41 refs.

A scanning multichannel microwave radiometer (SMMR) which operated from Oct. 1978 to Aug. 1987, and a special sensor microwave imager (SSM/I), which overlapped with the SMMR for nearly 2 months in 1987, provided microwave radiances which have been used to monitor long-term changes in sea ice concentration and snow accumulation. Inspection has shown, however, that brightness temperatures from the two sensors over the same polar firm-covered scene can differ by as much as 14 K. Calibration corrections for polar firm have been derived. This paper presents calculations addressing the physics of the small frequency and viewing angle differences between the SMMR and the SSM/I on microwave emission from polar scenes containing free water. The focus here is

only on surface emission, using a surface scattering model to study the effects of surface roughness, snow wetness, snow density, and young sea ice concentration. Data from Antarctica is also compared with modeled results. For most scenes, surface roughness dominates over the effects of frequency and viewing angle differences, but for open ocean long-term series, data must be calibrated and constructed at the geophysical product level rather than at the level of measured radiances. (Auth. mod.)

F-50634

Ram, M., Gayley, R.I., **Insoluble particles in polar ice: identification and measurement of the insoluble background aerosol**, *Geophysical research letters*, Mar. 15, 1994, 21(6), p.437-440, 12 refs.

This paper presents a new series of measurements of the size distribution of insoluble particles in the radius range 0.050-1.31 microns retrieved from Greenland ice cores. Taken together with previous measurements, this work demonstrates that an insoluble background aerosol with a very distinctive size distribution exists. It is also demonstrated that, in looking for evidence of the background aerosol, size distribution is a better indicator than particle concentration. Comparison with similar measurements from the antarctic ice sheet is also given. (Auth. mod.)

F-50644

Bettoli, M.G., et al, **Activity of Be-7 and Pb-210 in snow samples at Terra Nova Bay-Antarctica: preliminary results**, *Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic*, Kirkenes, Norway, Aug. 23-27, 1993. Edited by P. Strand and E. Holm, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, p.229-232, 7 refs.

Preliminary data of ^7Be and ^{210}Pb activity are presented in samples of snow precipitation and total atmospheric depositions collected during the 1990-91 and 1991-92 expeditions, which will constitute the base of future investigations. The data so far collected, though very limited, appear to show that "wet" deposition is the main mechanism of deposition for ^{210}Pb and ^7Be in a coastal antarctic area, and show the probably less efficient but still relevant role of snow in precipitation scavenging of both radionuclides. (Auth. mod.)

F-50645

Martinotti, W., et al, **Vertical distribution of ^{210}Po and ^3H in some ice and snow cores collected in Antarctica (Terra Nova Bay Inlet)**, *Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic*, Kirkenes, Norway, Aug. 23-27, 1993. Edited by P. Strand and E. Holm, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, p.233-236, 7 refs.

This paper reports results on the contribution of the three radionuclides to ice and snow core radioactivity. In particular, some considerations were made of the methodology used for ^{210}Po and ^{210}Pb determination and a comparison of results between different techniques was performed. Concentrations of all the radionuclides investigated were within ranges of values reported by other authors in previously published data for the antarctic environment. (Auth. mod.)

F-50646

Qin, D.H., **Outline of the Workshop on the Study of Global Bio-Geospheric Chemical Cycling Record in Arctic and Antarctic Ice Cores**, *Journal of glaciology and geocryology*, Sep. 1993, 15(3), p.431-434, In Chinese. Review of a NATO Advanced Research Workshop, Annecy, France, Mar. 26-31, 1993.

The NATO Advanced Research Workshop on the Study of Global Bio-Geospheric Chemical Cycling Record in Arctic and Antarctic Ice Cores was attended by participants from 14 nations: Austria, U.S., Canada, France, Germany, Switzerland, Italy, Denmark, Belgium, U.K., Sweden, Lithuania, Japan, and China. Seven group seminars discussed components in the antarctic ice sheet: biogenic organic sulfur; volcanic sulfur; anthropogenic sulfur; nitric acid radical ions in firn; ammonia radi-

cal ions; origin of nitric acid radical ions; and carboxylic acid and halogen family elements. Of particular interest were the ice core records in Greenland and Antarctica of MSA (methanesulfonic acid) and SO_4^{2-} , NO_3^- and NH_4^+ , and CO_2 and halogens.

F-50667

Ridley, J., **Surface melting on Antarctic Peninsula ice shelves detected by passive microwave sensors**, *Geophysical research letters*, Dec. 14, 1993, 20(23), p.2639-2642, 18 refs.

A 13 year time series of spaceborne passive microwave radiance measurements over the Antarctic Peninsula ice shelves reveals a systematic increase in the duration of the summer melt season. Combined with data from meteorological stations on the Antarctic Peninsula, the annual motion and long-term trends of the 0 C isotherm can be monitored. (Auth.)

F-50682

Kelley, J.J., Meir, S., Wendler, G., **On the effects of sastrugi on snow albedo**, *International Symposium on Okhotsk Sea and Sea Ice*, 5th, Mombetsu, Hokkaido, Japan, Feb. 4-6, 1990. Abstracts, Mombetsu, Okhotsk Sea and Cold Ocean Research Association, 1990, p.55-58, 5 refs.

Albedo measurements were carried out during the austral summer of 1985-1986 at Site D-47 in the dry snow zone at an elevation of about 1560 m on the Adélie Coast. Mean albedo values were around 82.6%. Albedo increased with cloud thickness and was greater than 90% in whiteout. New snow had higher albedo values than older snow whose crystals had been destroyed by mechanical action. It was suggested that sastrugi reduce both the amount of solar radiation absorbed and the albedo of snow by casting shadows, with the size of the shadows depending on the form and direction of the sastrugi, solar position, height, and azimuth.

F-50687

Mazaud, A., Laj, C., Bender, M., **Geomagnetic chronology for antarctic ice accumulation**, *Geophysical research letters*, Mar. 1, 1994, 21(5), p.337-340, 23 refs.

The curve of ^{10}Be flux versus age in the Vostok ice core largely covaries with a synthetic curve calculated assuming that a large fraction of ^{10}Be production rate is modulated by changes in the geomagnetic field intensity. With this assumption, it is also possible to derive a precise chronology for the Vostok core. This chronology is in good agreement with a very recent glaciological chronology obtained for the Vostok ice core, and improves the correspondence of climate events recorded in antarctic ice with correlative events recorded in deep sea sediments. Therefore, the idea that changes in the ^{10}Be flux at Vostok may arise from variations in Earth's geomagnetic dipole field has to be seriously considered. This would imply that a large portion of the ^{10}Be deposited there is derived from lower latitudes. (Auth. mod.)

F-50698

Kamiyama, K., et al, **Glaciological data collected by the 33rd Japanese Antarctic Research Expedition in 1992**, *Japanese Antarctic Research Expedition. JARE data reports*, Mar. 1994, No.194, 67p., Refs. passim.

In 1992, three oversnow traverses were carried out by JARE-33 from Showa to Mizuho Station, and from there to Dome-F. Radio echo soundings were conducted in the summit area to obtain bedrock topography data for selection of a deep ice coring site. An outline is presented of field observations; position, elevation, ice thickness and gravity, net snow accumulation, and surface meteorological data are discussed and presented in tables.

F-50714

Willis, R.D., **Krypton-81 dating in polar ice samples**, *U.S. National Science Foundation. Small Business Innovation Research Programs. Report*, 1990, NSF/ISI-90126, 26p., PB94-143815, 17 refs.

Establishing a chronology for polar ice is vital to interpreting the climatic record preserved in ice. There is, at present, no method for dating ice absolutely beyond 50,000 years. The goal of this project is to establish a method for dating ice in the range of 50,000 to 1,000,000 years based on

measuring cosmogenic ^{81}Kr (half-life=213,000 y) in air trapped by the ice. The ^{81}Kr technique comprises the following steps: (1) extraction of ancient air from the ice, (2) separation of Kr from air, (3) separation of ^{81}Kr from stable Kr, and (4) direct detection of ^{81}Kr using resonance ionization time-of-flight spectrometry. Feasibility of the methodology was demonstrated by measuring ^{81}Kr in 168 kg of ice collected from the Allan Hills area of Antarctica. The ^{81}Kr age was determined to be 108,000 y (+82,000, -55,000). The ^{85}Kr content of the ice, measured by the same technique, was 17% modern, suggesting that the ice may have been contaminated *in situ* with modern air. Improvements in equipment should enable dating of less than 30 kg of ice or groundwater to within a few percent. Applications of the technique include environmental monitoring and tracer studies (^{85}Kr) and groundwater dating (^{81}Kr) for radioactive waste disposal site selection. (Auth.)

F-50719

Marchant, D.R., et al, **Quaternary changes in level of the upper Taylor Glacier, Antarctica: implications for paleoclimate and East Antarctic ice sheet dynamics**, *Boreas*, Mar. 1994, 23(1), p.29-43, 40 refs.

Glacial drifts perched alongside outlet glaciers that drain through the Transantarctic Mountains constrain inland polar plateau ice elevations. The Taylor Glacier, which heads in the Taylor Dome, drains East Antarctic ice into the Dry Valleys sector of Transantarctic Mountains and terminates in central Taylor Valley. Five gravel-rich drifts (including 39 distinct moraine ridges) fringe a lateral lobe of the Taylor Glacier in the lower Arena Valley, Quartermain Mountains, southern Victoria Land. ^3He and ^{10}Be exposure age dating, together with Arena Valley stratigraphy and soil morphologic data, provide chronologic control for these drifts and constrain maximum Quaternary thickening of the inland Taylor ice dome to less than 160 m. Textural analyses suggest that drift deposition occurred from cold-based ice, even though Taylor Glacier advances most likely occurred during global interglaciations. The thermal regime of former Taylor Glacier ice lobes, the character of geomorphic features superimposed on individual drifts, the chemical composition of soils developed on Taylor drifts, and the stability of moraine ridges on steep valley walls suggest that the present cold-desert climate in Arena Valley has persisted for at least the last 2.2 Myr. (Auth. mod.)

F-50799

Piccardi, G., et al, **Spatial and temporal trends of snow chemical composition at northern Victoria Land (Antarctica)**, *Terra Antarctica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.134-137, 16 refs.

Analytical data obtained from surface and deep snow samples collected during four summer campaigns permit the evaluation of the chemical composition of snow according to the geographical position of the stations and the seasonal cycles which influence the composition of atmospheric aerosol. The correlations between the principal and trace components make it possible to use certain compounds as indicators of the main contributors to the snow composition: marine spray, biological marine activity, atmospheric aerosol, crustal erosion and long range transport. The sharp coherent seasonal trend of some components permits a valid evaluation of the annual snow layers. These layers can be dated by coring or snow pits and the average annual accumulation at a given station can be established. (Auth.)

F-50867

Spindler, M., **Notes on the biology of sea ice in the Arctic and Antarctic**, *Polar biology*, July 1994, 14(5), p.319-324, Refs. p.323-324.

The sympagic organisms living internally within the sea ice or at the interfaces of ice/snow and ice/water provide a substantial part of the total primary production of the ice covered regions. In addition, sea ice organisms are an important food source for a variety of pelagic animals and may initiate phytoplankton spring blooms after ice melt by seeding effects. Sea ice organisms often are enriched by some orders of magnitude if the same volume of melted ice is compared to that of the underlying water column. Three hypotheses try to explain this discrepancy and are discussed. Investigations on the nutrient chemistry within the sea ice system and *in-situ*

observations still are rare. Intense growth of sympagic organisms can result in nutrient deficiencies, at least in selected habitats. Advances in endoscopic methods may lead to a better understanding of the life within the sea ice. (Auth. mod.)

F-50871

Squire, V.A., Robinson, W.H., Meylan, M., Haskell, T.G., **Observations of flexural waves on the Erebus Ice Tongue, McMurdo Sound, Antarctica, and nearby sea ice**, *Journal of glaciology*, 1994, 40(135), p.377-385, 22 refs.

New strain data relating to flexural oscillations of the Erebus Glacier Tongue (EGT), McMurdo Sound are presented and are analyzed in the frequency domain. The data were collected during Nov. 1989, just 3 months prior to the most recent calving of the ice tongue in Mar. 1990. A broadband oscillation centered on 50 s is found in both the strain measurements collected on the EGT and those collected on the sea ice nearby. The oscillation is shown, at least in part, to be propagating with a phase velocity of approximately 65 m/s in a direction away from the snout towards the grounding line, rather than being wholly due to a standing-wave pattern in the EGT. A coupling model between the sea ice and the EGT is proposed and is shown to compare reasonably well with the data. (Auth. mod.)

F-50872

Eicken, H., et al, **Textural characteristics and impurity content of meteoric and marine ice in the Ronne Ice Shelf, Antarctica**, *Journal of glaciology*, 1994, 40(135), p.386-398, 52 refs.

The texture and physical properties of an ice core recovered to 215 m depth from the Ronne Ice Shelf have been studied with regard to formation and transformation of the ice. At a depth of 152.8 m, a sharp discontinuity marks the transition between meteoric ice accumulated from above and marine ice accreted from below, as testified by electrolytical conductivity and stable-isotope measurements as well as geophysical field surveys. Automated image analysis of thin sections indicates that the decrease in grain-boundary density and the increase in grain cross-sectional area with depth are commensurate with, though not necessarily caused by, thermodynamically driven grain growth down to 120 m depth, corresponding to a vertical strain of roughly 65% as computed with a simple temperature-history particle-path model. The observed increase of grain-boundary density (i.e. decrease of grain-size) with age in the marine ice is in part explained by the thermal history of this layer. Salinities, brine volumes and solid-salt concentrations were computed from electrolytical conductivity measurements for the marine ice. An assessment of salt incorporation and desalination rates shows that these low salinities can at present only be explained by a unique densification mechanism of under-water ice crystals at the base of the ice shelf. (Auth. mod.)

F-50873

Isaksson, E., Karlén, W., **Spatial and temporal patterns in snow accumulation, western Dronning Maud Land, Antarctica**, *Journal of glaciology*, 1994, 40(135), p.399-409, 45 refs.

During the Swedish Antarctic Expedition to Queen Maud Land in 1988-89 the net snow accumulation was estimated for an area from the coast to about 400 km inland. Stake measurements were used to obtain the spatial variability and firn cores were used for the temporal variability. The mean annual accumulation for the period 1976-88 is about 0.4 m water equivalent (w.e.) for Riiser-Larsenisen and about 0.3 m w.e. for the area above the grounding line. The accumulation rate at higher altitudes, >2500 a.s.l., is about 0.1 m w.e. for 1955-88. One record from the ice shelf covers the period 1957-88, and suggests an increase in accumulation of about 12%. Between 1976 and 1988, the accumulation decreased by about 50%, most likely due to lower temperatures as suggested by the temperature record from Halley. (Auth. mod.)

F-50917

International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993, Watanabe, O., ed, **Proceedings, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, 408p., Refs. passim. For individual papers see 48-5325 through 48-5365 or F-50918 through F-50944.

More than 40 papers, many of which are pertinent to Antarctica, submitted and discussed at the 4th International Workshop on Ice Drilling Technology held in Tokyo, Apr. 20-23, 1993, are summarized in this vol-

ume. The papers are grouped according to the main subject area investigated, such as: electromechanical ice core drilling; thermal ice core drilling; non-ice-producing drilling; borehole measurements; ice core processing; ice core quality; borehole liquid; and drill camp orientation and logistics.

F-50918

Hansen, B.L., **Deep core drilling in ice, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.5-8, 15 refs.

A brief review is presented of the chronology of deep core drilling of ice dating from 1950, including locations, equipment and techniques used, related symposia held and participating individuals and supporting organizations. Several antarctic locations are mentioned.

F-50919

Kelley, J.J., et al, **Ice coring and drilling technologies developed by the Polar Ice Coring Office, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.24-40, 24 refs.

The search for "zero defects" ice cores continues to challenge the ice coring and drilling community. No single drilling and coring device will fill all needs. Each project will have special requirements and will require an initial decision as to the most effective drilling system to be used as well as ensuring personal and environmental safety. PICO has developed several types of drilling and coring systems, from a lightweight hand auger to more complicated electromechanical drills (dry and fluid-filled holes) with rock-penetrating capability and thermal drills. Logistics considerations are important, and a comparison is made between the drill types associated with system weight, expected power and drilling liquid requirements, and fuel consumption. Recent technological developments involve hot-water mechanical drilling, improvements in antifreeze and thermal drilling, the development of directional drilling, antifreeze dissolution drilling, and vibratory drilling. (Auth.)

F-50920

Morgan, V., et al, **Technical aspects of deep ice drilling on Law Dome, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.78-86, 3 refs.

The Dome Summit South (DSS) ice drilling project was designed to obtain a full depth ice core for high resolution studies of the Holocene and the transition from the last glacial maximum. The project used a new electromechanical drill based on the Danish ISTUK design. The main differences from the original ISTUK were an enclosed roller screw section and the use of a submersible brushless motor operating at ambient pressure in the drilling fluid. The field work started in 1988 when a 270 mm diameter hole was drilled to 84 m and cased with fiberglass reinforced plastic tube. The hole was continued to 96 m with a smaller thermal drill to make a suitable pilot hole for the mechanical drilling. In 1989 a steel arch drilling shelter was set up over the borehole and the drill winch and tower set up in the shelter. Most of the EM drilling was done in the 1991/92 and 1992/93 seasons. In Feb. 1993, drilling reached silty ice containing small rock fragments at a depth of 1200 m. This is close to the ice thickness measured by radio echo sounding. (Auth. mod.)

F-50921

Zhu, G.C., Han, J.K., **BZXJ super light ice core drill, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.87-92, 8 refs.

An advanced BZXJ drill was developed and named after key Chinese characters which mean an electro-mechanical ice core drill. Its main advantages are light weight, low power consumption and convenient installation. The drill has the merits of both an electro-mechanical Japa-

nese ice core drill and an American SIPRE/CRREL 3 inch auger. Its major specifications are: 160 cm length, 11 kg in weight, about 50 rpm core barrel rotation speed, about 35 cm length core section extracted during one run, 0.3 kW power consumption, 150 m depth capability. The total weight of the drilling system is 127 kg. The drill can be set up and operated by two specialists. A few glaciers have been drilled to bedrock in China by BZXJ. Also about 700 m total length of ice core has been obtained from the Collins Ice Cap, King George I. (Auth.)

F-50922

Tanaka, Y., et al, **Development of a JARE deep ice core drill system, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.113-123, 2 refs.

The final design of an electromechanical coring drill, very simple both in shape and in mechanism, is discussed and illustrated. It is a straight tube consisting of an antitorque section, motor and computer section, chip chamber and core barrel. Three cutters (rake angle: 30 to 40 degrees, pitch: 5 to 7 mm) are attached to cut an ice core 94 mm in diameter and bore a hole 135 mm in diameter. The maximum core length is 2.1 m. Chips are transported between the core barrel and the outer tube by a spiral rim attached to the core barrel. No motor for sucking chips up to the chip chamber is installed. The chips are separated from the liquid by a filter at the top of the chip chamber, and are compacted to a density of 500 kg/m³. In the pressure-tight electronics section, a computer, DC brushless motor (270 V, 600 W, 12,000 rpm) and reduction gear (1/170) are installed. (Auth. mod.)

F-50923

Narita, H., Shinbori, K., Kodama, Y., **Experiment on ice cutting under high liquid pressure and low temperature, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.124-131, 1 ref.

In order to examine dependencies of hydro-pressure and ice temperature in ice cutting performance of a drill for deep ice coring, experiments on ice cutting were carried out under liquid pressure from 0.1 MPa to 30 MPa at temperatures of 12.3, -40.3 C and -62.0 C while changing the rake angle of the ice cutter. The results showed that the penetration speed of the drill for a given rake angle decreased at lower temperature and higher pressure; for a constant penetration speed, larger torque was required at higher pressure and lower temperature. Also, the larger the rake angle, the smaller the penetration speed. When the rake angle of the ice cutter was 17 deg, the drill performed at the designed penetration speed. (Auth.)

F-50924

Kudriashov, B.B., Vasil'ev, N.I., Talalai, P.G., **KEMS-112 electromechanical ice core drill, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.138-152, 10 refs.

Design of the KEMS-112 electromechanical ice core drill (Russian abbreviation of core electromechanical drill; number 112 means final hole diameter) and results of drilling, borehole and core studies carried out on Vavilov Glacier, Severnaya Zemlya, and at Vostok Station are described. Characteristics and a description of the KEMS-112 drill suspended on a cable, and its surface technical devices, are given. In 1984, 1986 and 1988, the KEMS-112 drill was used for core drilling on Vavilov Glacier to depths of 89, 152 and 461 m. The last borehole reached the bed of the glacier and pierced subglacial frozen rocks to a depth of 2.3 m. In 1989 at Vostok Station a deep borehole drilled by a thermal drill was deepened by the KEMS-112 drill from a depth of 2428 m to 2546 m. (Auth.)

F-50925

Zagorodnov, V.S., Kelley, J.J., Nagornov, O.V., **Drilling of glacier boreholes with a hydrophilic liquid, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th,

Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.153-164, 22 refs.

During the last 20 years over 10,000 m of ice core have been recovered through the use of antifreeze thermal electric drills (ATED). An environmentally safe ethanol-water solution (EWS) was utilized as the borehole liquid. The ATED method has been widely used on high mountain temperate and polar glaciers. In Antarctica, a borehole of 800 m depth was drilled in ice at a glacier temperature of -53 C in two months. Drilling of this borehole was continued the next field season. The major cause of ice core fracture in thermal drilling is thermoelastic stress. The quality of an ice core taken under ATED can be significantly improved by applying the forced circulation of EWS at the borehole kerf. Experimental and theoretical studies demonstrate that a modified ATED (m-ATED) reduces power consumption by 20-40%. The penetration rate of the m-ATED at low temperatures (below -30 C) is estimated to be about 450 m/wk. The logistic cost for deep (>1000 m) drilling with ATED is estimated to be about 25% of the cost of conventional thermal or mechanical drilling. (Auth. mod.)

F-50926

Zagorodnov, V.S., Kelley, J.J., Koci, B.R., **Directional drilling**, Tokyo. *National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.165-171, 3 refs.

Directional Drilling (DD) technology can be used in deep glacier boreholes to obtain additional ice cores from any depth and create supplemental boreholes for geophysical research on glacier ice properties under natural conditions. Experimental directional drilling was done using an antifreeze thermal electrical drill (ATED) in a PICO test well. A special device called a whipstock was used for the deflection of the ATED in a previously-drilled borehole. The test demonstrated that a whipstock deployed in the main borehole permits directional drilling to obtain extra ice core. The experimental whipstock was placed 25 cm above the bottom of the 4.5 m deep borehole. The ATED was inclined in a previously-prepared cavity to an angle of up to 3 deg. When the second borehole reached a depth of about 6 m from the whipstock it had no inclination. The distance between axes of the main and secondary boreholes was about 0.3 m. The whipstock was frozen into the main borehole during the directional drilling experiment and afterwards it was heated electrically and removed from the hole. (Auth.)

F-50927

Narita, H., et al, **Thermal ice core drilling to 700 m depth at Mizuho Station, East Antarctica**, Tokyo. *National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.172-183, 4 refs.

As part of JARE's Glaciological Research Program in east Queen Maud Land, thermal ice core drilling to depth of 700.63 m was conducted at Mizuho Station in 1983-1984. For the operation, an improved version of the drill was designed. With the aid of a microprocessor, the drill could send to the surface analog data (converted to 8 bytes) on the temperature of the main heater, water tank, etc. during drilling. Drilling of the first borehole started on Apr. 22, 1983 and terminated on July 22 at 411.5 m depth. Drilling was stopped because closure of the borehole became so rapid that the drill was in danger of becoming stuck. On Mar. 11, 1984, reaming of the drillhole was conducted. The core drilling of the second borehole was started from the depth of 133.5 m on June 11 and finished on Aug. 1, 1984. At that time the drilling was conducted with larger clearance between the drill and the hole. A drill 168 mm in diameter was used for drilling to 633 m and another drill 142.6 mm in diameter was used down to 700.63 m depth. (Auth. mod.)

F-50928

Bobin, N.E., et al, **Equipment and methods of microbiological sampling from deep levels of ice in central Antarctica**, Tokyo. *National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.184-191, 11 refs.

The authors report on the equipment, methods and results of microbiological sampling from deep levels of ice in central Antarctica. The equipment includes a special microbiological drill laboratory (MBU), thermodrill (TELGA 14M), a unit for sterile sampling from the ice core (USL), and a borehole sampling unit (PMS-152). They report the methods of sterile sampling of ice core with the USL-unit, results of investigations of ice core from deep levels of ice, and new borehole sterile sampling with the PSM-152 unit carried out in 1991 at Vostok Station. (Auth.)

F-50929

Makinson, K., **BAS hot water drilling on Ronne Ice Shelf, Antarctica**, Tokyo. *National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.192-202, 12 refs.

The British Antarctic Survey has developed a hot water drilling system that was successfully used during the summers of 1990-91 and 91-92 to penetrate ice 562 m and 541 m deep on Ronne Ice Shelf. The hot water drill currently incorporates 300 kW of heating power with a water recirculation system, removing the need for continuous snow melting while drilling. In total, approximately 4 t of aviation fuel were burned at each of the 2 sites, allowing a hole 0.2-0.25 m in diameter to be drilled over a period of 1 to 3 days, and maintaining it through repeated reaming for a further 5 days. Ice temperatures of -26 C caused rapid refreezing of the hole; successive borehole caliper profiles indicated initial closure rates of 11 mm/hr, decreasing to 5 mm/hr after the hole had been open for a number of days. Access to the sub-ice shelf oceanographic environment allowed measurements to be made in the underlying seawater and the installation of thermistors in the ice and the ocean for long-term temperature monitoring. (Auth. mod.)

F-50930

Koci, B., **AMANDA project: drilling precise, large-diameter holes using hot water**, Tokyo. *National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.203-211, 11 refs.

The Antarctic Muon and Neutrino Detector Array (AMANDA) requires drilling of multiple hot-water holes 50 cm in diameter to depths exceeding 1 km. Strings of photomultiplier tubes 200 m long are then lowered into the holes and allowed to freeze in. Since the holes must be vertical and parallel, drilling techniques and instrumentation to provide these conditions are discussed. Freeze-back rates in -50 C ice and pressure developed during the freezing process are also considered. Additionally, adaptation of solar concentrators to minimize the use of large quantities of fuel is evaluated. Finally, the use of mechanical drilling to generate chips that are melted downhole is investigated as a means to speed up the drilling process and make uniform holes. (Auth.)

F-50931

Ishizawa, K., Takahashi, A., **Borehole drilling for sewage disposal at Asuka Station, East Antarctica**, Tokyo. *National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.212-217, 5 refs.

A borehole for sewage disposal was drilled at Asuka Station (930 m a.s.l.) in Jan. 1987. The borehole, 400 mm in diameter and 27.5 m in depth, was drilled 50 m distant from the main hut using a steam drilling system. The drilling speed was 4 m/h between the snow surface and 20 m depth. The total amount of kerosene used for melting snow and steam generation was 110 l. Sewage stored in the tank was directed to the borehole through a heated pipe. The cumulative amount of sewage was 1077 kl for 5 years, and the bottom of the hole rose 14 m. (Auth.)

F-50932

Raymond, C.F., Rogers, J.C., Taylor, P.L., Koci, B., **Vertical strain measurement in core holes**, Tokyo. *National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April,

20-23, 1993. Proceedings. Edited by O. Watanabe, p.234-240, 1 ref.

The method of measuring vertical displacement in a borehole developed by Rogers and La Chapelle has been adapted for core holes in polar ice sheets. The method uses metal bands injected into the hole as markers. The markers are located using a sensor consisting of an inductance coil in a tuned circuit that is detuned by mutual inductance as the coil approaches a conducting metal band. The principal change compared to the earlier instrumentation was an upscaling in size to accommodate a larger hole diameter and more robust construction of the components. Based on their experiences, the authors suggest an improved band injection method. (Auth.)

F-50933

Naruse, R., et al, **Borehole logging device at Dome F, Antarctica, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.241-246, 10 refs.

A borehole logging device has been newly developed for deep drilling starting in 1995 at Dome F, Antarctica. The device is designed to measure the diameter, inclination and azimuth of a hole, ice temperature and fluid pressure. A logging sonde, 2.35 m in length and 114 mm in diameter, has two sets of stabilizers and a caliper with three contact points. The possible range of measurement is from 130 to 170 mm in hole diameter. The data are transmitted by a microprocessor mounted in the sonde to a personal computer at the ice sheet surface. (Auth.)

F-50934

Chistiakov, V.K., et al, **Behavior of a deep hole drilled in ice at Vostok Station, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.247-255, 8 refs.

A coring hole (5G) was drilled at Vostok Station down to a depth of 2500 m using an electrothermal drilling system. Relationships among ice core, hole diameters and drill speed are presented. The hole was only partially filled with fluid (density of 860 kg/m³) so that ice pressure was not counterbalanced by the fluid column. After one year the hole deformation was found to be significant for depths below 1500 m. This information as well as data from the fluid density properties are used to predict the hole closure for greater depths. Due to some drawbacks in using a high-density fluid for thermal drilling operations, a technical strategy for drilling to 3000 m is presented. (Auth.)

F-50935

Das, D.K., Jois, S.S., **Thermal modeling of ice cores and boreholes via the finite element technique, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.256-280, 20 refs.

An axisymmetric finite element computer was developed to calculate heat transfer in cylindrical (r-z) geometry. The technique is applicable to steady-state and time-dependent problems and can handle convective, temperature-prescribed and heat-flux-prescribed boundary conditions. It employs the heat capacity method through the Dirac delta function to represent latent heat effect during freezing or thawing and computes movement of the phase front. A number of tests with different materials and boundary conditions were conducted to validate this code against heat transfer situations with and without phase change. The results showed good agreement with exact analytical and numerical solutions. The model was then applied to determine temperature profiles in ice cores. Subsequent investigations were made to determine the rate of freezing in a borehole and the movement of the freeze front with time. Furthermore, results were generated for predicting complete freeze-up of the ice test well maintained by the Polar Ice Coring Office (PICO) for a number of boundary conditions. PICO drills are designed for use in Greenland and Antarctica. (Auth. mod.)

F-50936

Zagorodnov, V.S., Kelley, J.J., Thompson, L., Watanabe, O., **Continuous study of an ice core: ECM, fine stratigraphy, air bubbles and crystals, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.281-290, 26 refs.

The continuous multi-parameter analysis of an ice core reduces time required for field and laboratory investigations. A method for producing a continuous thin section (TS) along an ice core is described. Semiconductor laser sensors (LS) and multiple electrodes were used for continuous measurements of electrical and optical parameters of the TS along the ice core. An ice core volume of 3-5% is thrown out during ice core preparation for Electrical Conductivity Measurements (ECM), stratigraphy, air bubble concentration, average bubble diameter, and linear dimensions of ice crystals. A modified commercial LS has a spatial resolution of about 0.1 mm. Opaque objects of about 1 micron diameter can be detected inside a TS. The concentration and average diameter of air bubbles can be measured. The fine stratigraphy of an ice core caused by air bubbles or solid particles can be studied inside a TS by LS. Using polarization effects, linear dimensions of ice crystals can be measured. Data from a Mizuho Station core are included. (Auth. mod.)

F-50937

Shoji, H., et al, **Ice core processing at Dome F, Antarctica, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.291-297, 5 refs.

The Dome F Project is an integrated field and laboratory research effort on deep core drilling and analysis at Dome F, Antarctica. Ice core processing starts immediately after core recovery in the field to combine core drilling activities with core analysis procedures. Key factors in processing procedures include core logging, brittle zone handling, field measurements, sample preparation and core packing for transportation. Designing of a core processing line is quite important to maximize the benefit of the field activity and guide and following laboratory analysis. Functions and tasks of core processing are discussed and a core processing line for Dome F is proposed. (Auth.)

F-50938

Uchida, T., et al, **Brittle zone and air-hydrate formation in polar ice sheets, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.298-305, 7 refs.

Microscopic observations of air bubbles and air-hydrate crystals included in the Vostok ice cores revealed badly fractured ice in those cores having high concentration of air bubbles. They also showed that the transformation of air bubbles to air-hydrate crystals reduced the chance of ice core fracture. In this paper, the authors suggest a fracture model of an ice core including air bubbles to discuss the depth dependence of ice core brittleness. (Auth.)

F-50939

Uchida, T., et al, **Optimized storage condition of deep ice core samples from the viewpoint of air-hydrate analysis, Tokyo. National Institute of Polar Research. Memoirs. Special issue**, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.306-313, 9 refs.

Experimental data on the dissociation rate of air-hydrate crystals in Vostok cores and Dye-3 cores, Greenland during their long term storage revealed that dissociation of the crystals affected the volume expansion of deep ice cores. The temperature dependence of the dissociation rate of the air-hydrate crystals determines the optimized storage temperature and the time period for both the transportation of ice cores and their long storage plans. The results also suggest that deep ice cores should be stored in the shape of bulk samples to prevent them from dissociating, including the air-hydrate crystals. (Auth.)

F-50940

Nagornov, O.V., Zagorodnov, V.S., Kelley, J.J., **Effect of a heated drilling bit and borehole liquid on thermoelastic stresses in an ice core**, *Tokyo. National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.314-326, 31 refs.

Thermal ice coring processes are accompanied by stresses in an ice core; micro- and macro-cracks are formed. Contamination from mechanical and thermal drilling usually penetrates from 5 to 30 mm into the ice core. The quality of ice core acquired by thermal drilling depends on thermal stresses. To improve ice core quality, experimental and theoretical studies have been done. A prototype model of an antifreeze thermal electrical drill (ATED) was tested. Temperature distribution in an ice core during thermal drilling was measured with thermocouples. To study temperature and stress distributions in the core, a mathematical model was developed. Impacts of ethanol-water solution (EWS) and kerosene on temperature and thermal stresses a core were also studied. The experiments and model simulations have shown that thermal stresses in an ice core are proportional to the ratio of drilling bit length to penetration rate. The maximal thermal stresses in a core during thermal drilling exhibit only weak dependence on the type of borehole liquid. Forced circulation of the borehole liquid at the kerf leads to reduced depth of cracks by about 10 mm. (Auth.)

F-50941

Gundestrup, N.S., Clausen, H.B., Hansen, S.B., Johnsen, S.J., **Hole liquids and gaskets for the ISTUK deep ice core drill**, *Tokyo. National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.327-334, 8 refs.

Deep boreholes in polar ice sheets have to be filled with a liquid in order to prevent hole closure due to the overburden pressure of the ice. In Greenland, at ice temperatures of -32 C, the limit for open hole drilling is 400 m. In Antarctica, a depth of 900 m has been obtained in an open hole. Any drilling to deeper depths needs to be performed in a liquid. The borehole liquid should have a density close to that of ice, be non-toxic, available in quantities at reasonable cost, compatible with the materials in the drill, non-aggressive to ice, and have a low viscosity to allow rapid drill movement in the borehole. In practice, no liquid has been available that can fulfill all the requirements. In the past, ethanol/water mixture, DFA/Glycol, DFA/TCE, JET-A1/PCE, DFA/F113, n-butyl acetate, and D60/F113 have been used. All these liquids have their advantages and disadvantages, and the use of any has involved severe compromises. In this paper, these ideal specifications are compared to those of the actually used hole liquids. (Auth.)

F-50942

Gosink, T.A., et al, **Fluids for use in deep ice-core drilling**, *Tokyo. National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.335-346, 19 refs.

Environmentally appropriate fluids have been sought to support the deep ice coring objectives of the glaciological programs of the U.S. National Science Foundation in Greenland and Antarctica. In the past several decades, three types of fluids have been used for ice coring activities: fuel oil (DFA), usually containing several percent of a dense halogenated solvent; aqueous ethanol or glycol solutions; and butyl acetate. Each has advantages and disadvantages. Primary criteria in the search for an acceptable ice coring fluid were that the density be close to that of the ice; that it be usable to about -56 C; and that it be as environmentally acceptable and non-toxic as possible. The best candidate drilling fluid that emerged was n-butyl, which is presently in use in Greenland. (Auth. mod.)

F-50943

Fujita, S., et al, **Drilling fluid for Dome F project in Antarctica**, *Tokyo. National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited

by O. Watanabe, p.347-357, 5 refs.

The search for a proper drilling fluid which can be used in the very cold environment at Dome F is reported. Although the investigations are still in progress, three kinds of fluid were chosen as drilling fluid candidates: n-butyl acetate; "IP-solvent" with densifier; and silicone oil. Their properties were investigated and compared in terms of density and viscosity, which are essential requirements for a drilling fluid. It was shown that n-butyl acetate and IP-solvent with densifier can be used as the drilling fluid. However, the use of n-butyl acetate is impossible without sufficient ventilation at the coring site or other action to dispose of its vapor. When IP-solvent with densifier is considered, the choice of proper densifier is also a problem. (Auth.)

F-50945

Crane, D., **Below the tip of an iceberg**, *Geographical*, Dec. 1993, 65(12), p.14-17.

This paper presents a popular account of iceberg origins and dynamics. It outlines the dangers of drifting ice to marine shipping and offshore structures, and considers the potential of icebergs as a fresh water resource, with special attention to ice-ocean interactions in Antarctica.

F-50948

Marshall, S., Oglesby, R.J., **Improved snow hydrology for GCMs. Part 1: snow cover fraction, albedo, grain size, and age**, *Climate dynamics*, July 1994, 10(1-2), p.21-37, 37 refs.

A new, physically-based snow hydrology has been implemented into the National Association for Atmospheric Research Community Climate Model 1 (NCAR CCM1). The snow albedo is based on snow depth, solar zenith angle, snow cover pollutants, cloudiness, and a new parameter, the snow grain size. Snow grain size in turn depends on temperature and snow age. With the new snow hydrology, springtime snowmelt occurs more rapidly, leading to a more reasonable late spring and summer distribution of snow cover. Little impact is seen on winter snow cover, since the new hydrology affects snowmelt directly, but snowfall only indirectly, if at all. As an application of the new snow hydrology, simulations involving antarctic and Northern Hemisphere glaciation have been repeated; these simulations were previously made with CCM1 and the old snow hydrology. Relatively little difference is seen for Antarctica, but a profound difference occurs for the Northern Hemisphere. In particular, ice sheets computed using net snow accumulations from the GCM are more numerous and larger in extent with the new snow hydrology. (Auth. mod.)

F-50955

Heidland, K., **Mapping the Ekströmsen ice shelf, Antarctica, from GEOSAT radar altimetry**, *Marine geodesy*, Apr.-June 1994, 17(2), p.95-106, 12 refs.

This paper reports on results obtained from the GEOSAT altimeter over the Ekström Ice Shelf, adjacent to the eastern margin of the Weddell Sea. The Ekström Ice Shelf, on which the German wintering station Neumayer (formerly Georg von Neumayer) is situated, is the main working area of German polar research activities. Measurements carried out by the GEOSAT altimeter between 1987 and 1989 were used in this study in order to determine ice shelf heights for mapping the Ekström Ice Shelf. The processing and analysis of altimeter measurements over the ice shelf indicate good height determination over flat ice sheets, with a precision of better than +/- 1 m, depending on the characteristics of the ice surface. (Auth. mod.)

F-50967

Casassa, G., **Features on the Ross Ice Shelf, Antarctica, studied with AVHRR satellite imagery and by modeling**, Columbus, Ohio State University, 1993, 175p., University Microfilms order No. 93-25469, Ph.D. thesis. Refs. p.155-162.

Visible, near infrared and thermal infrared Advanced Very High Resolution Radiometer (AVHRR) imagery at 1:1 km resolution is used to search for changes on the Ross Ice Shelf. Important changes in flow conditions are derived by careful comparison of the imagery with ancillary data. The evidence for the ice flow changes derived from AVHRR imagery includes: a large loop of the flow stripes observed northwest of Crary Ice Rise, interpreted to correspond to an increased activity of Ice Stream A relative to Ice Stream B occurring at least 1000 years ago; grounding line retreat on the northeast side of Roosevelt I. over the past 25 years; a linea-

ment 140 km long on the southern part of Roosevelt I., which could correspond to a stranded shear margin indicating that the ice was much thicker in the past; a disagreement between velocity vectors and AVHRR flow stripes downstream from Steers Head, suggesting change in flow conditions in the past 250 years; and a feature 40 km long and 4 km wide close to the grounding line of Ice Stream C, possibly corresponding to an ice raft torn from the inland ice sheet. These findings are important evidence that confirm the unsteady flow of the West Antarctic ice sheet inferred by other field workers. Modeling is used to investigate the decay of flow stripes. These features can be traced for several hundred kilometers and yet do not become obscured by snow accumulation. The model predicts that each surface topographic high must overlie a deep root, or keel. The presence of this root accounts for the slow decay time. (Auth.)

F-50974

Han, J.K., et al, **Concentration characteristics of soluble impurities in the surface snow of Collins Ice Cap, King George Island, Antarctica**, *Antarctic research*, Dec. 1993, 4(2), p.29-35, 12 refs. For Chinese version see F-49600.

Measurements carried out for the upper 10 m of firn/ice obtained at the main dome of Collins Ice Cap, King George I. revealed the direct relation of soluble impurities of snow mass to the composition of atmosphere aerosols over it. It was established that a sea-salt source dominates the atmosphere aerosol above the Collins Ice Cap. The simultaneous variation shown by the concentration profiles of Na^+ , K^+ , Mg^{2+} , Ca^{2+} , SO_4^{2-} , Cl^- , Br^- and very approximate EF values suggested their common marine source and a similar deposition process. Besides the possible surface contamination, NH_4^+ varied uniformly along the deeper part of the core in concentration, which could be considered as background value of ammonium. A satisfactory explanation for NO_3^- concentration profile could not be obtained at present. (Auth.)

F-50977

Yang, H.F., McTaggart, A.R., Burton, H., **Concentrations and distributions of free amino acids in sea and lake ice core of Antarctica**, *Antarctic research*, Dec. 1993, 4(2), p.62-74, 10 refs.

A sea ice core (1.6 m) and an ice core from Ace Lake (1.5 m), taken in Oct. and Nov. 1988 in the vicinity of Davis Station, were analyzed. Results showed the following: a seasonal variation in concentration of amino acids, with the highest values of 30.92 micromol/ml in the sea ice core and about 45 micromol/ml in the lake ice core; lowest concentrations were about 8.0 micromol/ml in the former, and 14.0 micromol/ml in the latter. The authors conclude that the uniform spectrum of amino acids is probably derived from a peptide cell source and those amino acids which were not used by organisms. (Auth. mod.)

F-50979

Kamiyama, K., et al, **Methods for *in situ* chemical analyses of snow and ice samples**, *Antarctic record*, Mar. 1994, 38(1), p.30-40, In Japanese with English summary. 12 refs.

Chemical analytical methods for snow and ice samples are discussed for the procedure *in situ*, taking field environments into consideration. The use of the ion exchange filter, for decreasing the sample volume to be carried back to the laboratory and for simplifying the pre-treatment for gross-B measurement, is discussed. Small systems for chemical determinations are also discussed. Small ion chromatography systems for measuring anions (F^- , CH_3COO^- , HCOO^- , CH_3SO_3^- , SO_4^{2-} , $\text{C}_2\text{O}_4^{2-}$, NO_3^-) with small amount of sample have been developed. A simple system, suitable for *in situ* measurement of NO_3^- , is discussed. (Auth. mod.)

F-50980

Kamiyama, K., Kanao, M., Maeno, H., Furukawa, T., **Gravity survey on the Mizuho Plateau, East Antarctica along the traverse routes to Dome-F from Syowa Station**, *Antarctic record*, Mar. 1994, 38(1), p.41-53, In Japanese with English summary. 15 refs.

Geophysical and glaciological surveys were carried out on the Mizuho Plateau from Showa Station to Dome-F in 1992 by the inland traverse team of JARE-33. Gravity values along the traverse routes were determined considering the correction of drift rates and some tears. Gravity anomalies were calculated by using data both of surface elevation from GPS positioning with some modification by atmospheric pressure, and of

the ice thickness from radio-echo soundings. The free-air gravity anomaly profiles correlate well with those of bedrock elevation. The continuous data of bedrock elevation beneath the Dome-F area, obtained by radio echo soundings, revealed the basin-like topographic structure of the glacier beds surrounded by bedrocks at comparatively higher altitude, which is supported by free-air anomaly data. (Auth. mod.)

F-51013

Han, J.K., et al, **General characteristics in stratigraphy and density variation for ice cores from Collins Ice Cap, King George Island, Antarctica**, *Antarctic research (Chinese edition)*, Mar. 1994, 6(1), p.40-46, In Chinese with English summary. 9 refs.

Two ice cores from the Collins Ice Cap on King George I. were studied: the Main dome, elevation 700 m, and the Small dome, elevation 250 m. The density curve in the Main dome core showed regular variations corresponding to the distribution of melt features in the stratigraphic record, and annual layers were roughly determined. It was estimated that the snow accumulation rate at the summit of Main dome was 3-3.5 m, which was about 1650-1925 $\text{kg/m}^2/\text{a}$ in water equivalent, and 2.0 m/a in mean ice thickness equivalent. The transition depth of snow to ice was 38-39 m. Above it, density increased gradually downward, but at a rather high rate due to appearance of the water table, reaching 900 kg/m^3 in a 5-6 m interval. The density data of the ice core from the summit of Small dome showed a fluctuation between 800 and 900 kg/m^3 . The snow accumulation rate at the summit of Small dome was about 0.7 m/a in ice equivalent, and the transition depth of snow to ice was 7-8 m, covering about 10 years of mass accumulated. Very thick volcanic deposition layers were discovered below 40 m in the ice core from the summit of Small dome. (Auth. mod.)

F-51014

Wen, J.H., et al, **Primary analysis of mass balance characteristics on small dome of Collins Ice Cap, King George Island, Antarctica**, *Antarctic research (Chinese edition)*, Mar. 1994, 6(1), p.47-57, In Chinese with English summary. 26 refs.

Analysis of data based on a year of measuring the mass balance of the small dome of the Collins Ice Cap (1991-1992) is reported. The dome is a glacial mass typical of cold seasons: periods of accumulation and ablation were clearly distinguishable; the melting at the bottom lasted two months longer than at the top; and the warm-season ablation decreased rapidly with increase of height. Mass balance characteristics showed larger mass balance gradient, lower mass balance level and smaller stability coefficient, which reflected the distinctive property of glacial mass balance under the condition of a subpolar maritime climate. (Auth. mod.)

F-51036

Goloub, P., Herman, M., Deuzé, J.L., Frouin, R., **Optical properties of snow/ice derived from aircraft polarization-and-directionality-earth-reflectance (POLDER) data**, *Antarctic journal of the United States*, 1992, 27(5), p.191-192, 11 refs.

During the 1991-1992 RACER campaign, the authors acquired one of the few existing photopolarimetric datasets over snow and ice. The measurements were made aboard a BAS Twin Otter with the Polarization and Directionality of the Earth Reflectance (POLDER) instrument. The POLDER imaging principle allows one to obtain instantaneously the bidirectional reflectance distribution function (BRDF) of a target if this target is nearly homogeneous within the swath of the instrument (4.9 x 6.5 km). These photopolarimetric observations corroborate earlier observations that the snow/ice system is close to a Lambertian reflector and that polarization over snow-ice targets is expected to be caused mainly by the atmosphere (molecules and aerosols).

F-51040

Goloub, P., Herman, M., Deuzé, J.L., Frouin, R., **Contrast between polarization properties of snow/ice and clouds**, *Antarctic journal of the United States*, 1992, 27(5), p.199-202, 5 refs.

Snow/ice and clouds affect the surface radiation balance strongly, yet differently. Confusing snow/ice with clouds may yield large errors in estimates of the solar energy reaching the surface in polar regions, with important consequences for an assessment of ice-atmosphere interactions, ice dynamics, and the carbon cycle. The photopolarimetric measurements made with the POLDER instrument during the 1991-1992 RACER cam-

paigh offer a unique opportunity to investigate whether polarization information at visible and near-infrared wavelengths can be used to make the distinction efficiently. By analyzing a few POLDER images, the authors demonstrate that polarization is a useful property of light that can be used to determine the nature of the targets.

F-51044

Udisti, R., Bellandi, S., Piccardi, G., **Analysis of snow from Antarctica: a critical approach to ion-chromatographic methods**, *Fresenius' journal of analytical chemistry*, 1994, Vol.349, p.289-293, 18 refs.

Ion-chromatographic methods for anion and cation determination in snow samples from Antarctica are evaluated with regard to sensitivity and selectivity. An eluent-step change method is proposed to determine simultaneously mono- and divalent cations with detection limits lower than 1 microgram/L. Special attention is given to the determination of the ammonium ion at trace levels in the presence of high sodium concentrations. The problems of sample contamination by the laboratory environment are evaluated. Two alternative methods, one using isocratic and the other a gradient elution, are proposed for the determination of fluoride, acetate, formate and methanesulphonate ions. Both methods are discussed to evaluate their use in snow sample analysis. (Auth. mod.)

F-51068

Hubold, G., **BIOMASS in relation to the sea-ice zone**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.355-361, Refs. p.360-361.

DLC QH95.58.S68

After a review of the manifold ecological features of the antarctic sea ice and the sea ice zone, three topics in the antarctic sea ice zone system which need priority attention are suggested: the factors controlling the life cycles and survival of the biota; the impact of sea-ice and ice biota on ocean-atmosphere exchanges; and the nature of biogeochemical cycles in the water column and benthos.

F-51072

King, J.C., Anderson, P.S., **Heat and water vapour fluxes and scalar roughness lengths over an antarctic ice shelf**, *Boundary-layer meteorology*, Apr. 1994, 69(1-2), p.101-121, 40 refs.

This paper presents eddy-correlation measurements of heat and water vapor fluxes made during the antarctic winter. The surface layer was stably stratified throughout the period of observation and sensible heat fluxes were always directed downwards. However, both upward and downward water vapor fluxes were observed. Their magnitude was generally small and the latent heat flux was not a significant fraction of the surface energy budget. The variation of heat and water vapor fluxes with stability is well described by Monin-Obukhov similarity theory, but the scalar roughness lengths for heat and water vapor appear to be much larger than the momentum roughness length. Possible explanations of this effect are discussed. (Auth. mod.)

F-51107

Parkinson, C.L., **Spatial patterns in the length of the sea ice season in the Southern Ocean, 1979-1986**, *Journal of geophysical research*, Aug. 15, 1994, 99(C8), p.16,327-16,339, 24 refs.

The length of the sea ice season summarizes in one number the ice coverage conditions for an individual location for an entire year. It becomes a particularly valuable variable when mapped spatially over a large area and examined for regional and interannual differences, as is done here for the southern ocean over the years 1979-1986, using the satellite passive microwave data of the Nimbus 7 scanning multichannel microwave radiometer. Three prominent geographic anomalies in ice season lengths occur consistently in each year of the data set, countering the general tendency toward shorter ice seasons from south to north: (1) in the Weddell Sea the tendency is toward shorter ice seasons from southwest to northeast reflective of the cyclonic ice/atmosphere/ocean circulations in the Weddell Sea region. (2) Directly north of the Ross Ice Shelf anomalously short ice seasons occur, lasting only 245-270 days, in contrast to the perennial ice coverage at comparable latitudes in the southern Bellingshausen and Amundsen Seas and in the western Weddell Sea. The short ice season off the Ross Ice Shelf reflects the consistently early opening of the

ice cover each spring, under the influence of upwelling along the continental slope and shelf and atmospheric forcing from winds blowing off the Antarctic continent. (3) In the southern Amundsen Sea, anomalously short ice seasons occur adjacent to the coast, owing to the frequent existence of coastal polynyas off the many small ice shelves bordering the sea. Trends in the ice season lengths over the 1979-1986 period are highly coherent spatially, with overall trends toward shorter ice seasons in the northern Weddell and Bellingshausen seas and toward longer ice seasons in the Ross Sea, around much of East Antarctica, and in a portion of the south central Weddell Sea. (Auth. mod.)

F-51220

Smiraglia, C., **Polar and alpine glaciers as different cryospheric sectors in global change studies** [Ghiacciai polari e ghiacciai montani: contributo e complementarietà dei diversi ambiti criosferici nello studio dei cambiamenti globali], Italy. Consiglio Nazionale delle Ricerche. Direzione Centrale Attività Scientifiche. Commissione Scientifica Polare. Atti del Seminario su "Il ruolo delle aree remote nello studio dei cambiamenti globali" (Role of remote areas in the study of global changes. Seminar proceedings), Rome, 1993, p.27-35, In Italian with English summary. 13 refs.

Glaciers are an essential component of the present environmental and climatic equilibria; moreover, the remote regions glaciers, especially polar glaciers, form a reliable archive of the composition of the atmosphere in the past and can give important paleoclimatic information up to 200,000 years ago. Because of differences in physical properties and in geographical location, mountain glaciers provide different environmental records than those derived from polar glaciers; the information from both sources is very important. This is confirmed by recent studies carried out by Italian researchers in Antarctica and in Greenland as well as in Asiatic mountain chains during national and international projects. (Auth. mod.)

F-51228

Boutron, C.F., Candelone, J.P., Hong, S.M., **Past and recent changes in the large-scale tropospheric cycles of lead and other heavy metals as documented in antarctic and Greenland snow and ice: a review**, *Geochimica et cosmochimica acta*, Aug. 1994, 58(15), p.3217-3225, 37 refs.

The investigation of the occurrence of lead and other heavy metals in antarctic and Greenland ancient ice and recent snow is of great interest in reconstructing the past natural tropospheric cycles of these metals and determining to what extent these cycles have now been altered by man. Because concentrations to be measured are exceedingly low, down to the sub pg/g level, reliable data can be obtained only if full control of contamination is achieved from field sampling to laboratory analysis. The available data show that the past natural concentrations of Pb, Cd, Zn, Cu, and Hg in antarctic ancient ice are highly dependent upon climatic conditions, the highest values occurring during the coldest periods of the ice ages, especially during the Last Glacial Maximum about 18,000 years ago. Human activity has led to an increase in lead concentrations during recent centuries both in Antarctica (tenfold increase) and in Greenland (two hundredfold increase). This last increase was followed by a 7.5-fold decrease during the past two decades, mainly as a consequence of the rapid fall in the use of lead alkyl additives in the USA as confirmed by recent isotopic data. (Auth. mod.)

F-51238

Saito, K., **Ice navigation in Lützow-Holm Bay in the Antarctic**, *Polar news*, Mar. 1994, No.58, p.16-21, In Japanese.

This is mainly a personal account of the author's experiences on three Japanese cruises through Lützow-Holm Bay to Showa Station, the 30th in the summer of 1988/89, the 32nd in the summer of 1990/91, and the 33rd in the summer of 1991/92. Two tables are included comparing the conditions of the pack ice and fast ice on each of the three cruises. The table for the pack ice shows the coordinates of the ice edge, the percentage of ice coverage, the ice thickness, and the snow depth on the ice; and the table for the fast ice shows the coordinates of entry into the fast ice, and also the ice thickness and snow depth on the ice.

F-51241

Uchida, T., et al, **Air-hydrate crystals in deep ice-core samples**

from Vostok Station, Antarctica, *Journal of glaciology*, 1994, 140(134), p.79-86, 17 refs.

Microscopic observation of air-hydrate crystals was carried out using 34 deep ice-core samples retrieved at Vostok Station. Samples were obtained from depths between 1050 and 2542 m, which correspond to Wisconsin/Sangamon/Illinoian ice. It was found that the volume and number of air-hydrate crystals varied with the climatic changes. The volume concentration of air-hydrate in the interglacial ice was about 30% larger than that in the glacial ice. In the interglacial ice, the number concentration of air-hydrate was about half and the mean volume of air-hydrate was nearly three times larger than that in the glacial-age ice. The air-hydrate crystals were found to grow in the ice sheet, at about $6.7 \times 10^{-12} \text{ cm}^3/\text{year}$, in compensation for the disappearance of smaller ones. The volume concentration of air-hydrate was related to the total gas content by a geometrical equation with a proportional parameter α . The mean value of α below 1250 m, where no air bubbles were found, was about 0.79. This coincided with an experimentally determined value of the crystalline site occupancy of the air-hydrate in a 1500 m core obtained at Dye 3, Greenland. In the depth profile of calculated α for many samples, α in the interglacial ice was about 30% smaller than that in the glacial ice. (Auth. mod.)

F-51242

Qin, D.H., Petit, J.R., Jouzel, J., Stievenard, M., **Distribution of stable isotopes in surface snow along the route of the 1990 International Trans-Antarctica Expedition**, *Journal of glaciology*, 1994, 140(134), p.107-118, 57 refs.

This paper presents the distribution of average δD and $\delta^{18}O$ values for the top 1 m of surface snow for a large area of Antarctica. The samples were collected on the 1990 International Trans-Antarctica Expedition which crossed the continent from the northern tip of the Antarctic Peninsula to Mirnyy Station. The empirical relationships among the isotopes, temperature and elevation are computed. The slopes of δD with respect to the surface temperature for the segments west and east of Vostok are not significantly different from those observed between Dumont d'Urville and Dome C which are often used to interpret deep ice-core isotopic profiles. There is, however, a noticeable shift between the two regression lines with, for a given temperature, higher isotopic values west of Vostok. The deuterium excess values ($d = \delta D - 8 \times \delta^{18}O$) increase sharply at 3000 m a.s.l. on the plateau, confirming the results of Petit and others. (Auth. mod.)

F-51243

Fujita, S., Mae, S., **Strain in the ice sheet deduced from the crystal-orientation fabrics from bare icefields adjacent to the Sør-Rondane Mountains, Dronning Maud Land, East Antarctica**, *Journal of glaciology*, 1994, 140(134), p.135-139, 13 refs.

Structural analyses of ice collected from the bare ice surface in the region of the Sør Rondane Mountains were carried out. Crystal-orientation fabrics and the disposition of surface cracks were investigated to determine the stress/strain configuration in the ice sheet near the mountains. Single-maximum fabric patterns with the axis of the maximum roughly perpendicular to the flow line on the horizontal plane were observed. It was deduced from the observations that the ice exhibits a fabric pattern indicating that the ice sheet is subjected to vertical shear strain between the ice flow and the nunataks. (Auth. mod.)

F-51244

Fastook, J.L., Prentice, M., **Finite-element model of Antarctica: sensitivity test for meteorological mass-balance relationship**, *Journal of glaciology*, 1994, 140(134), p.167-175, 25 refs.

A finite-element solution of the time-dependent mass-continuity equation for column-averaged ice-sheet flow and sliding is applied to the antarctic ice sheet. First, a calibration of the model to the steady-state present ice-sheet configuration is presented. With fitted values of the parameters describing the regions of sliding, the degree of bed coupling and the ice hardness, a change in the mean annual sea-level temperature is used to simulate variation of the climatic conditions over Antarctica for both warming and cooling of the climate. Paradoxically, a climate warming of up to 9 deg leads to an increase in ice volume, while cooling leads to decreasing ice volume as long as the present margins of Antarctica are maintained. Some extreme simulations of the antarctic ice sheet for "maxi-

mum over-riding" and "minimum warm climate" are shown for situations where the present bed conditions are altered. Finally, a time-dependent simulation shows the response of the ice-sheet system to cyclical variations in the simulated climate, demonstrating the lag of the ice-sheet response to be approximately 2700 years. (Auth.)

F-51245

King, E.C., **Observations of a rift in the Ronne Ice Shelf, Antarctica**, *Journal of glaciology*, 1994, 140(134), p.187-189, 1 ref.

During seismic profiling on the northwest Ronne Ice Shelf, a rift in the ice shelf was encountered. The rift trends southeast to northwest and is located approximately 30 km inland from the present-day ice front. The rift is 340 m wide and the surface elevation of the ice shelf drops by 14.65 m over the axis of the rift. The rift has an asymmetrical base with a near-vertical ice-water interface on its northeast flank and a more gently dipping ice-water interface forming its southeastern flank. The ice shelf thins from a thickness of 350 m away from the rift to a thickness of 225 m at the rift axis. The rift is the probable location of a future major calving event on this section of the Ronne Ice Shelf, an event which would release an iceberg of up to 30 km by 180 km into the Weddell Sea. (Auth.)

F-51271

Bondesan, A., Tison, J.L., **Glaciological research on Hells Gate Ice Shelf (Terra Nova Bay, Antarctica)**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.54-56, 4 refs.

The glaciological joint research program (Italy-Belgium) on Hells Gate Ice Shelf (HGIS), carried out during the 1993-94 Italian Antarctic Expedition, is the continuation of former studies executed during the 1989-90 expedition. The research aimed to reach a better understanding of the processes occurring at the ice/sea water interface under ice shelves; of the formation and evolution of marine ice accreting under the ice shelf, and of the ice shelf behavior under potential future global changes.

F-51272

Bondesan, A., Libera, V., Meneghel, M., Salvatore, M.C., **Glaciological investigations in the Terra Nova Bay area**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.57-58.

The fieldwork carried out by the authors is part of the Research Program 2a 'Glaciology and Palaeoclimate of the IX Antarctic Expedition'. It includes mass balance measurements for the strandline and tarn flat glaciers and the monitoring of the two lakes in the area; study of the morphology of glacial drift in blue ice areas and of periglacial polygons of till deposits; observations on lakes at tarn flat, Inexpressible I. and Edmonson Point; geomorphological surveys on the southern portion of the Northern Foothills, and field checks for thematic cartography performed in Italy by remote sensing.

F-51273

Caneva, G., Lozej, A., Merlanti, F., Tabacco, I., **Integrated geophysical surveys of the Hells Gate Ice Shelf and the Enigma Lake basin (northern Victoria Land)**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.59-60.

In the course of the 1993-94 Italian Antarctic Expedition, as part of Glaciology and Paleoclimatic Project, item 2a: Ice Physics and Geophysical Exploration, geophysical surveys were undertaken to define the geometrical and physical characteristics of the ice shelf near Hells Gate and the small basin of Enigma Lake. An objective of the work was also to provide information about adequacy of the different techniques applied and about potential requirements for future surveys.

F-51274

Maggi, V., Barbante, C., Laj, P., Udisti, R., **Glaciological investigation in northern Victoria Land: preliminary results**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.61-62, 3 refs.

During the 9th Italian Antarctic Expedition, nine shallow snow/firn cores were drilled in different sites of northern Victoria Land. Drilling sites were selected on the basis of the wind patterns and of glacier flow conditions inferred from satellite data. Selected sites, elevation and corresponding depths of the recovered cores are listed in a table. For each core, the authors calculated the firn density by direct weighing of the core bags. Measured densities for five of the drilling sites are shown in a figure. There is a significant variability of the density within each firn core, possibly indicative of changes in the snow grain size.

F-51276

Frezzotti, M., Tabacco, I., Vincent, C., Vittuari, L., **Station Concordia oversnow traverse programme, 1993-94**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.68.

During the 1993-94 season two oversnow traverses were performed as part of the Franco-Italian program Station Concordia in the framework of EPICA (European Programme on Ice Coring in Antarctica) and of ITASE (International Trans-Antarctic Scientific Expedition) programs. The French antarctic program undertook the first oversnow traverse from Dumont d'Urville to Dome C. This traverse was performed from Nov. 10 to Dec. 18, 1993. The Italian Antarctic Research Programme (PNRA) undertook a field survey of the first leg of the Terra Nova Bay Station-Concordia Station (Dome C) traverse. This survey was performed during the 1993-94 season. The distance covered was 280 km, while the total distance between Terra Nova Bay and Dome C is about 1,200 km. The purpose of this preliminary traverse was to verify the accessibility of the plateau from Terra Nova Bay Station with heavy vehicles.

F-51280

Thomsen, H.H., Hagen, J.O., **Glaciological research in Antarctica, Grønlands Geologiske Undersøgelse. Rapport**, 1994, No.160, p.83-86, 22 refs.

During 1991 and 1992 the Geological Survey of Greenland (GGU) was observer on behalf of the Danish Polar Center in and preparation of a common Nordic research effort in Antarctica. The Nordic Antarctic Research Programme (NARP) involves Norway, Sweden and Finland, which are all Antarctic Treaty Consultative Partners, whereas Denmark is an observer. A natural continuation of this work was Danish participation in the antarctic research, and a GGU glaciologist took part in the Norwegian Antarctic Research Expedition (NARE) 1992-93 arranged by the Norwegian Polar Research Institute. The expedition started from Cape Town in South Africa, Dec. 8, 1992 and ended at the same place on Mar. 9, 1993. The Danish glaciological work in Antarctica took the form of stable isotope studies on blue ice areas near the Norwegian research station Troll in Queen Maud Land. (Auth. mod.)

F-51282

Jarvis, E.P., King, E.C., **Seismic wavefield recorded on an antarctic ice shelf**, *Journal of seismic exploration*, 1993, Vol.2, p.69-86, 21 refs.

A description is given of the seismic wavefield recorded on the Larsen Ice Shelf from a walkaway experiment. The experiment used a 2 km receiver spread with single geophones at 5.2 m intervals. The source was buried explosive charges. On the recorded wavefield individual phases are identified. These include diving waves and their multiples, dispersive ground roll, mode converted reflections and multi-path multiple reflections. The velocities of propagation, amplitudes and the frequency content of the different phases are described. The data have been analyzed to determine the physical properties of the firn and ice layers of the ice shelf as they affect the propagation of seismic energy. (Auth.)

F-51302

Grenfell, T.C., Warren, S.G., Mullen, P.C., **Reflection of solar radiation by the antarctic snow surface at ultraviolet, visible, and near-infrared wavelengths**, *Journal of geophysical research*, Sep. 20, 1994, 99(D9), p.18,669-18,684, 56 refs.

The variation of snow albedo with wavelength across the solar spectrum from 0.3 micron in the ultraviolet (UV) to 2.5 microns in the near infrared (IR) was measured at Amundsen-Scott South Pole Station during the antarctic summers of 1985-86 and 1990-91. Similar results were obtained at Vostok Station in summer 1990-91. The albedo has a uni-

formly high value of 0.96-0.98 across the UV and visible spectrum, nearly independent of snow grain size and solar zenith angle, and this value probably applies throughout the interior of Antarctica. The albedo in the near IR is lower, dropping below 0.15 in the strong absorption bands at 1.5 and 2.0 microns; and it is quite sensitive to grain size and somewhat sensitive to zenith angle. Near-IR albedos were slightly lower at Vostok than at South Pole, but day-to-day variations in the measured grain size due to precipitation, drifting, and metamorphism were found to cause temporal variations in near-IR albedo larger than those due to any systematic geographical change from South Pole to Vostok. The spectrally averaged albedos ranged from 0.80 to 0.85 for both overcast and clear skies, in agreement with measurements by others at South Pole and elsewhere in Antarctica. By using a two-layer radiative transfer model, the albedo can be explained over the full wavelength range. Tests were made to correct for systematic errors in determining spectral albedo. (Auth. mod.)

F-51304

Bamber, J.L., Harris, A.R., **Atmospheric correction for satellite infrared radiometer data in polar regions**, *Geophysical research letters*, Sep. 15, 1994, 21(19), p.2111-2114, 16 refs.

Mie scattering models suggest that the thermal infrared emissivity of snow is relatively insensitive to variations in its properties and is dependent primarily on viewing angle. This gives rise to the possibility of accurately measuring snow surface temperatures over the polar ice sheets, using satellite infrared radiometers operating in the window region at 10-13 microns. These instruments were designed primarily to measure sea surface temperature and a substantial body of work has been undertaken on correcting for the effects of variable absorption by the atmosphere over oceans. The atmospheric conditions over the antarctic and Greenland ice sheets are significantly different, however, and require special treatment. A three year dataset of radiosonde measurements, collected from six antarctic stations, is used to investigate the behavior of the "split-window" algorithm. The same dataset has been used to test the performance of a dual-view algorithm that can be used with the Along Track Scanning Radiometer onboard ERS-1. It is shown that, given accurate emissivity estimates, the atmospheric correction has an rms error of 0.015 K using the dual-view method. Combined with the excellent calibration and stability of the Along Track Scanning Radiometer and pixel averaging to reduce the detector noise, it is possible to derive snow surface "skin" temperature to an accuracy of about 0.1 K. (Auth. mod.)

F-51306

Shabtaie, S., Bentley, C.R., **Unified theory of electrical conduction in firn and ice: site percolation and conduction in snow and firn**, *Journal of geophysical research*, Oct. 10, 1994, 99(B10), p.19,757-19,769, 49 refs.

In a study derived from ice sheet resistivity soundings from Dome C, East Antarctica, the conduction process in firn is modeled by the theory of percolation and conduction in disordered systems. In effect, firn is an infinite cluster of ice crystals with a statistically defined geometry. The properties of such clusters can be studied by random resistor network lattices, where the connectivity of the continuous conducting material can be controlled stochastically. These mixtures of conducting and insulating materials show a percolation threshold at which the conduction abruptly ceases. The structure of cold polar solid ice shows one ice crystal packed by 14 to 16 neighbors. As the density decreases, the number of nearest neighbors diminishes, which reduces the number of clusters that could contribute to the conduction process. From the volume fraction of ice at pore closeoff and the symmetry of the firn a critical volume fraction 0.08 (density equal to 0.07 Mg/m³) at which the conductivity should vanish is obtained. These experimental observations and analyses explain why Looyenga's empirical mixture equation approximates the transport properties of firn. Furthermore, the analyses indicate that for the current to be transported from one crystal to up to 14 to 16 neighbors the ionic impurities must either be located in the ice lattice by substitution (i.e., with bulk conduction taking place) or from a coating of impurities that surround the crystal like a shell. (Auth. mod.)

F-51316

Webster, J.G., Brown, K.L., Vincent, W.F., **Geochemical processes affecting meltwater chemistry and the formation of saline ponds in the Victoria Valley and Bull Pass region, Antarctica**, *Hydrobiologia*, Apr. 22, 1994, 281(3), p.171-186, 25 refs.

Major ion, trace element and nutrient concentrations have been determined in meltwater streams, frozen lakes and isolated saline ponds of the Victoria Valley and Bull Pass regions in Victoria Land. Geochemical processes affecting glacial meltwater composition with time and distance from the source glaciers include solute acquisition by soil salt leaching and solute concentrations by evaporation. Evaporation in the marginal lake melt and in isolated saline ponds appears to increase the Mg/Ca ratio of these meltwaters relative to that of meltwater streams. With progressive evaporation gypsum and calcite may precipitate, leading to the development of Na-Cl and Na-HCO₃ brine ponds. These ponds may be vertically stratified with respect to temperature and salinity if they experience partial or complete freezing over the winter season. The chemical characteristics and nutrient concentrations of meltwaters in the Victoria Valley are similar to those of other drainage systems in the region, although the Ca-Cl brines reported from the Wright Valley immediately to the south were not observed. Trace element (Cu, Pb, Zn, Cd, Mn and Fe) concentrations measured in the lakes and large ponds do not show any evidence of unusual enrichment in the drainage. (Auth.)

F-51320

Abyzov, S.S., Mitskevich, I.N., **Microflora of the antarctic continental and marine ice (with regard to the problem of using icebergs as resources of fresh water)**, *Microbiology*, May 1994, 62(6), p.582-593, Translation of Mikrobiologiya 62(6):994-1017, Nov.-Dec. 1993. 186 refs.

This paper gives a review of the research into the microflora of antarctic continental and marine ice sheets with particular reference to the potential utilization of icebergs as sources of high-quality fresh water. Microbiological research methods applicable to investigating continental and marine ice are considered. Data on the qualitative and quantitative composition of the microflora of polar and oceanic ice are given. (Auth.)

F-51369

Jull, A.J.T., et al, **Measurements of cosmic-ray produced ¹⁴C in firn and ice from Antarctica**, *Nuclear instruments and methods in physics research B*, June 1994, 92(1-4), International Conference on Accelerator Mass Spectrometry, 6th, Canberra-Sydney, Australia, Sep. 27-Oct. 1, 1993. Proceedings, p.326-330, 17 refs.

In this paper the levels of ¹⁴C in firn and ice from two regions accumulating ice in Antarctica, Dome C and Newall Glacier, are analyzed. The observed concentrations indicate variable amounts of *in-situ* ¹⁴C from cosmic-ray spallation of oxygen. ¹⁴C appears to be produced as both CO and CO₂ in variable amounts, but results suggest rapid conversion of ¹⁴CO to ¹⁴CO₂. Much of the *in-situ* ¹⁴C is retained, which results in a significant modification of the ¹⁴C/¹²C in ice derived from trapping of air at and below the firn-ice transition zone. This means that direct dating of accumulating ice cannot be used without correction for the *in-situ* ¹⁴C. In Newall ice, some evidence for an enhancement in *in-situ* ¹⁴C at or near the time of the Maunder Minimum is seen. Results for Dome C firn and ice indicate higher levels of *in-situ* in older ice. This is due either to a reduced accumulation rate in the past, or possible variations in cosmogenic ¹⁴C production. The levels of *in-situ* ¹⁴C in firn and ice and its impact on ¹⁴C dates on trapped CO₂ in ice are discussed. (Auth. mod.)

F-51370

Van Roijen, J.J., et al, **Dry extraction of ¹⁴CO/72 and ¹⁴CO from antarctic ice**, *Nuclear instruments and methods in physics research B*, June 1994, 92(1-4), International Conference on Accelerator Mass Spectrometry, 6th, Canberra-Sydney, Australia, Sep. 27-Oct. 1, 1993. Proceedings, p.331-334, 14 refs.

A dry extraction method was used to obtain trapped CO₂ in 2-5 kg ice samples from a blue ice zone in East Antarctica. In situ tests produced ¹⁴C, which was also extracted in ¹⁴CO₂ and ¹⁴CO concentrations at a ratio of 3.4 +/- 0.9. Correction of trapped ¹⁴CO₂ resulted in ice dates in the range of 5-15 ka. The realistic rates for accumulation and ablation of ice indicate the high efficiency of the dry extraction method. (Auth. mod.)

F-51380

Können, G.P., **Photopolarimetry of halos and ice-crystal sizing**, *Antarctic journal of the United States*, 1992, 27(5), p.293-296, 3 refs.

During nearby displays the author recorded the linear polarization and intensity distributions of halos and simultaneously made replicas of the halo-generating ice crystals. His purpose was to explore halopolarimetry as a tool of remote sensing for crystals and to relate the diffraction broadening of the halo polarization and intensity directly to the sizes of the collected crystals. It is concluded that halo polarimetry is a sensitive tool for detecting birefringent crystals in the terrestrial atmosphere or in the atmospheres of other planets. However, for certain halos, including the parheliion, the optically determined crystal size bears no obvious relationship to the real crystal dimensions in the halo-generating cloud. At South Pole and Vostok, the polarization of several other types of halo have been recorded. Some findings are summarized.

F-51381

Carlson, R.W., Arakelian, T., Smythe, W.D., **Spectral reflectance of antarctic snow: "Ground truth" and spacecraft measurements**, *Antarctic journal of the United States*, 1992, 27(5), p.296-298, 4 refs.

The authors briefly describe field measurements of the spectral reflectance of snow at two sites, and compare the optically derived snow grain sizes with photographic measurements of the surface grains. These "ground-truth" data are then used to corroborate spacecraft remote-sensing measurements, thereby extending the localized measurements to continental scales. Spectra obtained at the Amundsen-Scott and Vostok stations are shown in a figure. The well-known water-ice absorption features occurring at 0.81, 0.90, 1.04, 1.25, 1.50, 1.65, and 2.0 microns are quite evident. All of these absorption features are stronger in the Vostok spectrum than at South Pole. This can be explained as longer path lengths for light passing through the absorbing ice grains, i.e., the snow particles at Vostok are larger than those at Amundsen-Scott Station. The mean grain size appears to vary across the continent, but the observed distribution shows no immediately obvious correlation with topographical or meteorological parameters. Because the rate of solar energy absorption depends upon grain size, this spatial variability must be considered in climatological estimates of the net albedo of Antarctica.

F-51408

McKay, C.P., Clow, G.D., Andersen, D.T., Wharton, R.A., Jr., **Light transmission and reflection in perennially ice-covered Lake Hoare, Antarctica**, *Journal of geophysical research*, Oct. 15, 1994, 99(C10), p.20,427-20,444, 31 refs.

The transmission and albedo of the perennial ice cover on Lake Hoare was investigated, using year-round measurements of the photosynthetically active radiation (400-700 nm) under the ice, measurements of the spatial variation of the under-ice light in midsummer and spectrally resolved measurements from 400 to 700 nm of the albedo and transmission of the ice cover in early (Nov.) and in midsummer (Jan.). Results show that the transmission decreases in early summer, dropping by a factor of about 4 from Nov. to Jan. due to heating in the upper layers of the ice cover and the formation of Tyndall figures. The spectrally resolved measurements from 400 to 700 nm show that about 2-5% of the incident light in this spectral region penetrates the 3.5 m thick ice cover. The spectral data were analyzed using a two-stream scattering solution to the radiative transfer equation with three vertical layers in the ice cover. A surficial glaze of scattering ice 1 cm thick overlies a layer of sandy, bubbly ice about a meter thick, and below this is a thick layer of sand-free ice with bubbles. Significant changes in the thickness of the ice cover have been reported at Lake Hoare, due primarily to changes in the thickness of the bottom layer only. Because this layer is relatively clear, the effect on the transmission through the ice cover from these changes is less than would be predicted by assuming a homogeneous ice cover. (Auth. mod.)

F-51412

Saraf, A.K., Jain, S.K., **Geographic information systems for mass balance studies of a Himalayan glacier and part of antarctic shelf ice**, International Symposium on Snow and Related Manifestations, Manali, India, Sep. 26-28, 1994. Extended abstracts, Manali, India, Snow and Avalanche Study Establishment, 1994, p.336-339, 4 refs.

One of the most important aspects of glacier studies is to assess the regime of its ice body, i.e. to evaluate whether the ice body has increased or decreased in volume during the study period. The present study demon-

strates the capabilities of GIS to handle spatial data in the form of point data, isolines, sections, etc. available from various stake readings, and to estimate more accurately the total water equivalent, ablation and mass associated with the Chhota Shigri glacier in the Himalayas and part of the antarctic shelf ice. Digital elevation models were generated using GIS to calculate ice/snow thickness and ice/snow density associated with different points. The present study is based on data available in published reports. (Auth.)

F-51459

Desideri, P.G., Lepri, L., Checchini, L., Santianni, D., **Organic compounds in surface and deep antarctic snow**, *International journal of environmental and analytical chemistry*, 1994, Vol.55, p.33-46, 11 refs.

Eight surface snow samples taken during the 1987-88, 1988-89 and 1990-91 Italian antarctic expeditions and six samples collected at different depths from two dissimilar sites during the 1990-91 expeditions were analyzed for the non-chlorinated organic content using the GC capillary columns technique and GC-MS. Several biogenic and anthropogenic classes of organic compounds were identified and quantitatively determined. The data obtained give a more complete picture of the pollution level in Antarctica. (Auth.)

F-51474

Gloersen, P., Campbell, W.J., Cavalieri, D.J., Comiso, J.C., Parkinson, C.L., Zwally, H.J., **Pacific rim sea ice as observed with the Nimbus-7 SMMR**, Conference for Pacific Ocean Environments and Probing, Okinawa, Aug. 25-31, 1992. PORSEC '92. Proceedings. Vol.2, Shimizu, Shizuoka, Japan, PORSEC (Pacific Ocean Remote Sensing Conference) Secretariat, 1992, p.639-644, 1 ref.

Data collected by the Scanning Multi-channel Microwave Radiometer (SMMR) on the Nimbus-7 spacecraft have been analyzed to provide spatial and temporal coverage of sea ice in the polar regions from Oct. 28, 1978 through Aug. 20, 1987. The region selected includes the Seas of Japan and Okhotsk, as well as the Bering Sea and, in the South Pacific, the Amundsen, Bellingshausen, and Ross Seas. Monthly averages of the sea ice concentration in all of these seas are presented, as are time series of single-day records, obtained every other day on the average, of the area enclosed by the ice boundaries, the areal coverage of ocean by ice, and the open water area within the ice boundaries. Interannual variability and the 8.8-year trends are also described, as well as the contribution of the Pacific-rim regions to the overall negative trend of ice coverage in the Arctic, and the lack of trend in the Antarctic during this period.

F-51476

Nishio, F., Cho, K., **Disintegrating ice front of Shirase Glacier, East Antarctica**, Conference for Pacific Ocean Environments and Probing, Okinawa, Aug. 25-31, 1992. PORSEC '92. Proceedings. Vol.2, Shimizu, Shizuoka, Japan, PORSEC (Pacific Ocean Remote Sensing Conference) Secretariat, 1992, p.658-662, 8 refs. For another version see 48-1061 or 21F-49301.

At the mouth of the Shirase Glacier, a 15 km wide floating ice tongue extending 70 km to the north at its longest extent was recorded in 1961. At the grounding line the mean velocity is 2.5 km per year; the ice thickness is about 500 m and gradually decreases towards the front. The positions of the front of the ice tongue have been determined since 1957 by ground survey and recently by LANDSAT MSS and TM, and MOS-1 MESSR satellite images. Since 1957 the ice tongue has been disintegrating the ice front to the mouth of Shirase Glacier and at present there is no ice tongue evident in MOS-1 MESSR imagery obtained in Jan. 1990 and 1991 by the Multi-purpose Satellite Receiving System at Showa Station. Since 1957 the floating ice tongue has disintegrated three times: in the mid-1960s, 1980 and 1988. (Auth. mod.)

F-51477

Warner, R.A., Kniskern, F.E., **Migration of operational ice analysis and forecasting to a workstation platform at the Joint Ice Center**, Conference for Pacific Ocean Environments and Probing, Okinawa, Aug. 25-31, 1992. PORSEC '92. Proceedings. Vol.2, Shimizu, Shizuoka, Japan, PORSEC (Pacific Ocean Remote

Sensing Conference) Secretariat, 1992, p.727-730.

The Joint Ice Center (JIC) is responsible for producing global, regional, and local ice analyses and forecasts for the Arctic, Antarctic, and the Great Lakes. Traditional hard copy/grease pencil methods of manual analysis have been the principal model of ice analysis until recently. The JIC now has a prototype Digital Ice Analysis and Forecast System (DIFAS-version 0) that has been used to demonstrate the applicability of computer science as a tool for the interactive production of ice analyses. This paper discusses the suite of products produced at the JIC, the interim use of manual drafting techniques blended with DIFAS-0, and the future plans for integration of interactive digital techniques as well as the computer systems necessary to meet these goals.

F-51486

Van Woert, M.L., **Satellite observations of the Filchner/Ronne Ice Shelf front and their implications for bottom water formation**, *Filchner-Ronne Ice Shelf Programme (FRISP). Report*, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.16-19, 12 refs.

DLC G890.F55R47 No.7 1994

In this study sea ice concentrations for the polynya region are derived from Nimbus-7 scanning multichannel microwave radiometer (SMMR) and the Defense Meteorological Satellite Program special sensor microwave imager (SSM/I) data. The combined data set spans the period Oct. 1978 to June 1991 and allows temporal changes in ice concentration along the FRIS to be examined.

F-51487

Makinson, K., **BAS hot water drill, Filchner-Ronne Ice Shelf Programme (FRISP). Report**, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.20-26, 5 refs.

DLC G890.F55R47 No.7 1994

To date, BAS hot water drilling carried out on Ronne Ice Shelf has been used to provide and maintain access holes to the sub-ice shelf oceanographic environment for periods of several days until fuel supplies have become exhausted. Throughout the whole operation constant refreezing of the hole is a major problem, placing pressure upon operators and testing the reliability of equipment; careful planning is required if hot water drilling is to be successful. Parameters such as ice temperature profile, refreezing rates, hole diameter and the heat loss characteristics of the drilling hose have to be taken into consideration to determine fuel requirements, logistical support for the project and the time period available for oceanographic work. In total, approximately four tonnes of aviation fuel were burned at each of two sites, allowing a hole 0.2-0.25 m in diameter to be drilled over a period of 1 to 3 days, and maintaining it, through repeated reaming, for a further five days. Ice temperatures of -26 C caused rapid refreezing of the hole and successive borehole caliper profiles indicated initial closure rates of 11 mm/hr, decreasing to 5 mm/hr after the hole had been open for a number of days.

F-51488

Nixdorf, U., Oerter, H., Drücker, C., Miller, H., **Hot water drilling on Ekströmsen 1993, Filchner-Ronne Ice Shelf Programme (FRISP). Report**, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.27-28.

DLC G890.F55R47 No.7 1994

A hot-water drill developed during the past 2 years at Alfred Wegener Institute was used to penetrate the Ekström ice shelf several times near Neumayer Station in Jan. 1993. The drilling operation was successful and the initial large diameter (35 cm) allowed for easy access to the ocean. One hole was used to install an ultrasonic echo-sounder to measure the ablation at the ice shelf bottom directly. The upward looking sounder continuously records its own distance to the ice shelf bottom; this distance varies periodically with time. From a spectrum analysis it is concluded that the sounder follows the tidal current. Because the actual motion of the sounder is complex, melting rates are deduced from the variation in the maximum distances. This yields melting rates of 23 cm/month during Mar. and Apr.

Another hole carried a thermistor string throughout the 237 m thick ice shelf for ice temperature measurements. This will provide a second possibility to deduce ablation rates.

F-51489

Oerter, H., et al, **Comparison between ice core B13 and B15, Filchner-Ronne Ice Shelf Programme (FRISP). Report**, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.29-36, 9 refs.

DLC G890.F55R47 No.7 1994

Glaciological investigations have been carried out on the Filchner-Ronne Ice Shelf as part of German antarctic research work since 1979. During the austral seasons 1989/90 and 1992 ice cores B13 and B15 were recovered. Comparison of both cores focuses on snow and firn density, temperature distribution, 2-H and 18-O contents, and electrolytical conductivity. Special emphasis was given to the transition between meteoric and marine ice over a depth of about 2 m in each core. Comparison of the vertical profiles provides information about the variability of marine ice accumulation rate, its mode of accretion, the position where accumulation sets in along the flowline, and the ice shelf deformation rate. In the general approach taken here it is assumed that the last two factors do not vary appreciably for B13 and B15. The variability of the first two factors is assessed by comparing electrolytical conductivity, isotope content, and the microstructure of the ice in both cores. (Auth. mod.)

F-51491

Smith, A.M., **Introduction to high resolution seismic surveys on the Rutford Ice Stream, Filchner-Ronne Ice Shelf Programme (FRISP). Report**, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.39-41, 1 ref.

DLC G890.F55R47 No.7 1994

The aim of these surveys of Rutford Ice Stream was to investigate the bed of the ice stream and the properties of the ice itself to understand more of the basal processes affecting ice flow. Two main sites were selected for this initial study. The first site lies upstream of a prominent surface (and bedrock) knoll where survey data, bedrock profiles and the smooth ice surface seen on satellite images indicate an area of relatively low basal shear. The first field season concentrated on this area. A second site 50 km farther upstream shows a much more variable surface and bed topography, and was visited during the second season to investigate a variable bed, more characteristic of the upper reaches of the ice stream. Surveys were also done at a number of other sites, including one 12 km upstream of the first area. Reflection profiling and wide angle reflection were the two methods used to collect most of the seismic data. A brief preliminary assessment is given of the data collected. (Auth. mod.)

F-51494

Bombosch, A., Jenkins, A., **Modelling the formation and deposition of frazil ice beneath the Filchner-Ronne Ice Shelf, Filchner-Ronne Ice Shelf Programme (FRISP). Report**, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.53-55, 11 refs.

DLC G890.F55R47 No.7 1994

The numerical model of ice shelf-ocean interactions to be discussed in this presentation is based on the theory of turbulent gravity currents. It is suggested that melt water rises along the highest negative gradient of the ice shelf base, cooling and diluting a part of the surrounding ocean and forming a buoyant Ice Shelf Water plume. As a result of its upward motion, the plume water is subjected to a continuously decreasing pressure, and a depth is reached at which the water becomes supercooled. Assuming that seed crystals exist, the plume water now fulfills the conditions for the rapid growth of small, disc-shaped ice crystals within the water. The growth and multiplication of the ice crystals prevents further supercooling of the plume water, so that direct freezing onto the ice shelf base is a secondary process. Under varying conditions of motion, ice crystal deposition takes place. The results of the model applications to the area beneath Filchner-Ronne Ice Shelf show how the physics of crystal growth

and deposition naturally leads to the localized regions of intense accumulation, which are needed to explain the formation of the different marine ice bodies found.

F-51496

Long, D.G., Early, D., **Sea ice observed at enhanced resolution by spaceborne scatterometers**, Oceans'93 Conference, Victoria, British Columbia, Oct. 18-21, 1993. Proceedings. Vol.3, New York, Institute of Electrical and Electronics Engineers, 1993, p.III25-III30, 6 refs.

Spaceborne scatterometers such as the Seasat-A (SASS) and the ERS-1 Active Microwave Instrument (AMI) scatterometers measure the radar backscatter of the earth's surface at a resolution of approximately 50 km. While adequate for studying winds over the ocean, the low resolution limits the utility of the scatterometer data for land and ice studies. However, by using a recently developed resolution enhancement algorithm the authors have been able to produce a time series of enhanced resolution radar backscatter of sea ice in the southern polar region. The images dramatically reveal seasonal change in the sea ice. Large-scale circulation and mixing patterns are evident and the ice edge is readily discernible. Comparisons between Ku-band (SASS) images and C-band (ERS-1) images are made. The results suggest that scatterometer data coupled with the resolution enhancement technique is useful in sea ice studies. The frequent multiple-incidence angle revisits may provide the capability to map ice age and snow cover. (Auth. mod.)

F-51547

Jouzel, J., Lorius, C., Johnsen, S., Grootes, P., **Climate instabilities: Greenland and Antarctic records**, *Académie des sciences, Paris. Comptes rendus. Série II*, July 7, 1994, 319(1), p.65-77, With French summary. Refs. p.76-77.

The study of the two Summit Greenland ice cores GRIP and GISP2 has provided a wealth of information about climate variability in the North Atlantic region over the last glacial-interglacial cycle (the last ca. 150,000 years). The results are largely based on the isotopic composition of the ice which provides an estimate of local temperature changes. The aim of this Note is to put the Summit records in a global perspective through a comparison with the antarctic isotopic record from Vostok. As in Greenland, the last deglaciation warming is in Antarctica a two-step process interrupted by a return to colder conditions. However, the antarctic cooling appears to precede the Younger-Dryas Northern Hemisphere event and is much weaker. The most prominent of the interstadials observed in Greenland during the glacial may be identified in the Vostok record whereas the less accentuated ones are eliminated. The situation differs during the last interglacial: no antarctic counterpart to the rapid changes observed in Greenland has yet been detected. (Auth.)

F-51561

Udisti, R., Casella, F., Piccardi, G., **Role of methanesulphonic acid in snow samples from Terra Nova Bay (Antarctica)**, International Symposium, Belgirate, Italy, Oct. 13-15, 1992. Proceedings. Dimethylsulphide: oceans, atmosphere and climate, edited by G. Restelli and G. Angeletti and Air Pollution Research Report 43, Dordrecht, Kluwer Academic Publishers, 1993, p.153-162, 31 refs.

DLC QC879.6.D56

Concentration profiles of Cl^- , total SO_4^{2-} , nss- SO_4^{2-} and MSA for two snowpits at Terra Nova Bay are reported. The spatial distribution of these compounds is correlated with the altitude and geographic position. On the basis of H_2O_2 determination, the seasonal trends of nss- SO_4^{2-} , MSA and MSA/nss- SO_4^{2-} ratio are discussed. A sharp seasonal trend with summer maxima and winter minima is observed and demonstrates their common origin from DMS. A lower seasonal signal and lower concentration levels are found for the higher station. The MSA/nss- SO_4^{2-} ratio at low MSA values and the correlations between MSA and nss- SO_4^{2-} may evidence the existence of an extra-DMS nss- SO_4^{2-} source, which becomes more important in the winter period when the DMS contribution is lower. (Auth.)

F-51592

Hulbe, C.L., Whillans, I.M., **Stop-and-go GPS in Antarctica**, *Surveying and land information systems*, Sep. 1993, 53(3), p.150-

158, 10 refs.

A strain grid on the surface of the West Antarctic Ice Sheet was surveyed by continuously tracking phase from antennas on moving sleds towed by snowmobiles. The grid covers a 25 km by 10 km region on a fast-flowing stream of ice within the ice sheet. At least four such anomalous currents are now active. Their origins and implications are yet to be determined, but they may indicate the collapse of the ice sheet. The objective of this work is to study horizontal gradients in strain rate to determine the internal mechanical controls on the streaming ice flow. In operation, geodetic-quality Global Positioning System (GPS) receivers acted as reference bases. Two similar receivers were towed on sleds to each of the stations of the grid. The stations were steel conduit poles set vertically in the snow. The sled was pulled next to the station, and the GPS antenna was placed on top of the pole for 25 seconds or longer. At least two GPS vectors to each station were obtained. (Auth.)

F-51622

Baroni, C., Orombelli, G., **Holocene glacier variations in the Terra Nova Bay area (Victoria Land, Antarctica)**, *Antarctic science*, Dec. 1994, 6(4), p.497-506, Refs. p.504-505.

Information on Holocene glacier variations in Antarctica is limited and sometimes contradictory. However, if the behavior of the glaciers during the recent past can be clarified, their sensitivity to climatic changes can be evaluated and their contribution to sea level variation may be predicted. Through the study of local glaciers and floating ice shelves in the Terra Nova Bay area, new information has been gathered. Between 7500 and 5000 BP, after the glacial retreat which followed the Last Glacial Maximum, the Nansen Ice Sheet and the Hells Gate ice shelf were a few km less extensive than they are now. During the second half of the Holocene, both the local glaciers and the ice shelves advanced to positions that were more extensive than their present ones, although not all the variations are adequately dated. A retreat phase of the Edmonson Point glacier occurred during the late Middle Ages between 920-1050 A.D. and 1270-1400 A.D., as documented by ten ^{14}C dates obtained from shells in ice-cored moraines. A subsequent advance occurred after the 15th century in a period corresponding to the Little Ice Age. (Auth.)

F-51625

Morris, E.M., Vaughan, D.G., **Snow surface temperatures in West Antarctica**, *Antarctic science*, Dec. 1994, 6(4), p.529-535, 23 refs.

Snow temperatures measured at ca. 10 m depth over the period 1957-1992 have been used to derive a map of mean annual snow surface temperature corrected to sea level over the Antarctic Peninsula and Filchner-Ronne Ice Shelf. Multiple linear regression analysis was used to calculate rates of change with latitude, longitude, altitude and time, for data to the west and east of the topographic divide running along the spine of the Antarctic Peninsula. Climate warming on the Filchner-Ronne Ice Shelf follows the trend observed at Halley Bay, a coastal station nearby. High spatial variability leads to uncertainty in the temporal trend for mean annual snow surface temperature in the Antarctic Peninsula, but there is some indication that the large trends observed at Faraday and Marguerite Bay, two stations on the west coast of the peninsula, are attenuated inland. (Auth.)

See also:

A-50034 A-50035 A-50288 A-51483 B-49507 B-49714 B-49717
B-49720 B-50319 B-50320 B-50360 B-50550 B-50622 B-50657
B-50868 B-51029 B-51113 B-51114 B-51138 B-51175 B-51288
B-51317 B-51467 B-51469 B-51470 B-51565 B-51612 C-50449
C-50450 C-50502 C-50665 C-50689 C-50708 C-50993 C-51035
C-51192 C-51310 C-51403 C-51484 C-51485 C-51490 C-51597
D-51309 E-49670 E-49680 E-49687 E-49781 E-49798 E-49806
E-49816 E-49817 E-49908 E-49909 E-50106 E-50126 E-50127
E-50132 E-50133 E-50138 E-50175 E-50203 E-50217 E-50228
E-50270 E-50602 E-50603 E-50604 E-50635 E-50731 E-50748
E-50824 E-50903 E-50988 E-51111 E-51168 E-51257 E-51275
E-51277 E-51284 E-51357 E-51404 E-51410 G-49500 G-49590
G-49591 G-49683 G-49949 G-50607 G-50944 G-51411 I-49529
I-49575 I-49697 I-49702 I-49746 I-49747 I-49782 I-49911
I-50021 I-50177 I-50187 I-50361 I-50382 I-50448 I-50538
I-50541 I-50625 I-50690 I-50691 I-50693 I-50709 I-50712
I-50876 I-50877 I-50878 I-50879 I-50947 I-50949 I-50953

I-51104 I-51109 I-51125 I-51153 I-51225 I-51300 I-51368
I-51376 I-51503 I-51556 I-51596 I-51626 J-49625 J-49641
J-49679 J-49708 J-49788 J-49983 J-49987 J-50306 J-50307
J-50332 J-50343 J-50355 J-50357 J-50372 J-50408 J-50413
J-50534 J-50536 J-50537 J-50542 J-50697 J-50734 J-50763
J-50847 J-51101 J-51145 J-51407 J-51415 J-51433 J-51457
J-51458 J-51472 J-51475 J-51492 J-51493 J-51580 K-50415
L-49898 L-49899 L-50176 L-50503 L-51595 M-50852

G. LOGISTICS, EQUIPMENT & SUPPLIES

G-49500

U.S. Naval Support Force Antarctica, **Operation Deep Freeze 92/93 end of season report**, 1993, var. p.

This report describes the military support provided to the National Science Foundation in conjunction with the U.S. Antarctic Program from Aug. 1992 to Mar. 1993 as Operation Deep Freeze 92/93. The Naval Support Force provided the fundamental life support requirements of food and medical services to McMurdo Station residents and the logistic and communications pipeline for resupply of McMurdo, South Pole, Byrd Surface Camp, and other seasonal field parties, plus support for the nearby Scott Base and the Russian station at Vostok. A chronological summary of significant events during the operating period is given. The various organizations, units, and commands participating in Operation Deep Freeze 92/93 are listed, and their activities and recommendations are described in sufficient detail to provide guidance for future seasons.

G-49590

Yamanashi, M., Hannuki, T., Ishizawa, K., **On the snow drift formation around observation buildings of Asuka Camp in the Antarctic and differential settlement of the buildings constructed on a bearing layer of snow. 1. Properties of snow drift formulation around observation buildings**, *Nihon yuki kogakkai taikai ronbun hokokushu (Japan Society for Snow Engineering. Proceedings)*, Jan. 1993, Vol.9, p.173-178, In Japanese.

Three prefabricated buildings consisting of a living quarters hut, a generator hut, and an observation hut were erected at Asuka Station in Dec. 1984, Dec. 1985, and Dec. 1986, respectively. Each was approximately 20 m long, 5 m wide, and 3 m high, raised on steel truss platforms about 1 m high, and oriented with their long axis parallel to the prevailing winds east to west. They were observed for snowdrifts and differential settlement in each succeeding year until Dec. 1990. Within a year of installation, each of the huts was completely buried in snowdrifts with peaks of about 1 m above the roof, and extending about 50 m windward, 300 m leeward, and 140 m to each side.

G-49591

Hannuki, T., Futami, K., Ishizawa, K., **On the snow drift formation around observation buildings of Asuka Camp in the Antarctic and differential settlement of the buildings constructed on a bearing layer of snow. 2. Properties of differential settlement of the observation buildings**, *Nihon yuki kogakkai taikai ronbun hokokushu (Japan Society for Snow Engineering. Proceedings)*, Jan. 1993, Vol.9, p.179-182, In Japanese. 3 refs.

This is the second of two parts. Part 1 described observations of snowdrifts around three buildings at Asuka Station, a living quarters hut, a generator hut, and an observation hut, oriented with their long axis parallel to the prevailing winds east to west. This paper describes observations of differential settlement, that is, settlement of different parts of a structure at different rates, of the three buildings. In 1987-1989, the greatest degree of settlement in the living quarters hut was 5 cm on the north side and 12 cm on the south side, and in the observation hut, 17 cm on the north side and 20 cm on the south side. The living hut shifted 25 cm leeward between Dec. 1985 and Apr. 1990, and the observation hut shifted 45 cm leeward between Feb. 1987 and Apr. 1990. The authors suggest that differential settlement was affected by differences in snowdrift and snow density distributions. Graphs are included showing the differential rates of settlement of the buildings.

G-49673

Mikhailov, A.A., et al, **Atmospheric corrosion of metals and alloys at the Mirnyi Station in Antarctica**, *Protection of metals*, Sep. 1993, 29(1), p.8-14, Translated from Zashchita metallov. 15 refs.

Rates of atmospheric corrosion of St3, copper, cadmium, and D-16 aluminum alloy have been measured in a climatic region of Antarctica with very strong winds at the Mirnyi coastal station. Sulfate and chloride content in soluble corrosion products were determined. Analysis of the results, taking into account climatic factors during the test period, suggested the possibility of metal corrosion propagating in a humid atmosphere at subzero temperatures. These results are compared with those of atmospheric tests of metallic materials in coastal and continental subarctic regions in the Far East. (Auth.)

G-49683

Pyne, A.R., Preston, D., Webster, B., **Drilling options**, Antarctic Stratigraphic Drilling, Cape Roberts Project, Workshop report. Royal Society of New Zealand, Misc. Ser. No.23, Wellington, New Zealand, 1992, p.19-22.

Diamond core wireline drilling with a recirculating mud system is proposed to continuously core strata off Cape Roberts. Four holes 500 m deep are planned over two summer seasons. Drilling will take place from the 1.5+ m thick fast sea ice; surveys of sea ice movement over three seasons have shown that movement is consistent and small, amounting only to about 5 m over a four week period. This is not significant for drilling in the planned water depths of 150-500 m. Options for a sea riser include a multicasing riser and a single tensioned casing (preferred); both would have floats. (Auth.)

G-49684

Macfarlane, M., **Logistics options**, Antarctic Stratigraphic Drilling, Cape Roberts Project, Workshop report. Royal Society of New Zealand, Misc. Ser. No.23, Wellington, New Zealand, 1992, p.23-26.

Scientific drilling off Cape Roberts will require a camp at the cape for 35 persons for two seasons (lesser numbers for seasons before and after), with committed full time ground and helicopter support. Options for delivery of equipment and supplies include by ship to Cape Roberts and by tractor train 125 km across the fast ice from McMurdo Station-Scott Base. Fuel will be transported in and stored in drums at Cape Roberts for safety and environmental reasons. The Cape Roberts camp would best be a mix of 6 prefabricated modules for kitchen, ablutions, generators etc. and a further 14 light-weight dismantlable buildings. It is proposed to set up the camp on the fast ice adjacent to Cape Roberts to minimize environmental impact. A small drill site camp and science facility is needed to house 7 drilling and science personnel at the site and to allow basic core description, processing and documentation to be carried out. Because the camp and drill rig will be located on annual fast ice, all buildings and the drilling rig must be designed for rapid pull-down and removal in case ice conditions deteriorate unexpectedly. In addition, to enable two drillholes to be completed in one season the full camp must be capable of being moved and re-sited within a 48 hour period. (Auth.)

G-49924

Hannuki, T., Sano, M., Hirayama, Z., **Construction of the new central building of Syowa Station, Antarctica. 2. Production and transportation of building elements and building work at Syowa Station**, *Antarctic record*, Nov. 1993, 37(3), p.319-347, In Japanese with English summary. 8 refs.

Production, packaging and transportation of building elements for the new central building at Showa Station are reviewed. The foundation and steel framework was carried out in Jan. 1991; the laminated timber structure work and exterior and interior finishing were done in Jan. 1992. Electric, air conditioning and fire protection equipment, and the plumbing system of the building, were set up in Jan. 1993. The new building total floor area covers 721 sq m and consists of 3 storeys. A total of 2,100 men were employed, working 7 hr/d each. A new construction system with large scale laminated timber was used. The method of working with con-

crete in Antarctica was improved. A fireproof laminated timber structure was adopted, using large building elements and a new system for joining elements. (Auth. mod.)

G-49949

Sodhi, D.S., Rand, J.H., Tobiasson, W., **Stress analysis of a proposed tunnel under the South Pole skiway**, *Eastern Snow Conference and Western Snow Conference. Proceedings*, 1993, Joint 50th and 61st, p.347-354, 8 refs.

Unlined tunnels in the snow at South Pole Station will be used for safe movement of personnel to satellite science buildings during the austral winter. The first 1.8 m (6 ft) wide, 3 m (10 ft) high tunnel will pass under the existing skiway. This study determined the depth at which that tunnel should be located to be safe when aircraft pass over it. Three efforts were undertaken: (a) conducting a three-dimensional elastic stress analysis of the snow around the tunnel, (b) comparing the maximum tensile and shear stresses from that analysis with corresponding strengths published in the literature, and (c) performing two experiments at South Pole to determine the surface pressure required to fail the snow around model tunnels. The authors found general agreement of theoretical and experimental results and recommended that the roof of the tunnel be located at least 6.1 m (20 ft) below the surface of the skiway. (Auth. mod.)

G-50037

Dimmler, W., Klindt, H., **New electronic system for the rectangular midwater trawl (RMT)**, *Marine biology*, Nov. 1990, 107(2), p.345-348, 12 refs.

DLC QH91.A1 M35

This paper describes a modified modern version of the original rectangular midwater trawl (RMT) manufactured by the Institute of Oceanographic Science (IOS). The shipboard acoustic transducer and the underwater RMT-monitor were replaced by an electronic interface box while the data transfer was realized by a single-conductor cable. Using frequency shift keying (FSK) signal transmission, a PC-controlled system onboard handles data acquisition and control as well as real time monitoring of the haul. The volume of water filtered by the net is calculated based on the online readings of a net-angle sensor. The new RMT-system was successfully used in the Antarctic during the European Polarstern Study (EPOS) from Oct. 1988 to Mar. 1989. Fifty-seven tows to a maximum depth of 1000 m in open waters and in ice-covered areas were performed. (Auth.)

G-50039

Enss, D., **Construction of the new Neumayer Station in Antarctica** [Der Neubau der Neumayer-Station in der Antarktis], *Hansa*, Sep. 1992, 129(9), p.877-892, In German.

The construction of the new Georg von Neumayer German Station, completed in Mar. 1992, about 8 km southeast of the original station, completed in Mar. 1981 on the Ekström Ice Shelf, is described. The new station was designed and built by Polarmar, a company based in Bremerhaven. The main facilities are housed in three corrugated steel tubes, each about 100 m long and 8 m in diameter, covered with 50 cm of snow. Also described are the diesel and wind power generators, the water supply system, and the communications equipment. Scheduled for 1993 are a tunnel connecting the main facilities to a garage on the north side, and a ventilation tunnel 155 m long, 2.5 m high, and 2.1 m wide on the south side. Site and floor plans are included with some English captions.

G-50151

Cowper, D.N.B., Steele, M., **RV Nathaniel B. Palmer winter ice tests in Antarctica: ice-propeller interaction**, *Transport Canada. Publication*, Aug. 1993, TP 11632E, 77p. + appends., With French summary. 11 refs.

An antarctic operational assessment of the *Nathaniel B. Palmer*, a new U.S. antarctic research vessel with icebreaking capability, was conducted from Aug. 23-Sep. 3, 1992. As part of this international cooperative program, propulsion machinery dynamic responses during ingestion of ice by the propellers were measured and analyzed. Shaft torque, thrust, and displacement were measured along with propeller pitch, engine rpm, rudder angle, and ship speed. Stern tube bearing lubrication temperature and pressure were manually recorded at regular intervals. The propulsion system performed well under extremely heavy ice conditions, and no damage

occurred. The heaviest ice conditions were encountered near the South Orkney Is., where repeated backing and ramming operations in 1.3 to 4.0 m thick ice were required. Nozzle blockage and ice milling occurred frequently, and an extensive data set was collected. In level ice of 48 to 90 cm, ice/propeller interaction rarely occurred. Time history plots were analyzed to determine the dynamic responses and type of interaction. Parametric plots were produced illustrating the influence of ice and propulsion parameters on the maximum responses. The maximum recorded increases in torque and thrust due to ice milling were 219 kNm (92% of Bollard) and 516 kN (128% of Bollard) respectively. The shaftline response characteristics were similar to those measured on other vessels fitted with nozzled propellers. The successful execution of this project has resulted in an excellent set of data that complements the growing database used to develop and validate ice class propulsion system modeling, design and regulatory criteria. (Auth.)

G-50196

Sheĭnsteĭn, A.S., Shpil'rain, E.E., **Solar energy potentialities and prospects in Antarctica** [Vozmozhnosti i perspektivy ispol'zovaniia solnechnoi energii v Antarktide], *Antarktika*, 1993, No.31, p.185-192, In Russian with English summary. 18 refs.

Solar energy potentialities in different climatic zones of Antarctica are considered. Based on the developed design procedure, total solar radiation on sloped surfaces is evaluated and their optimal orientation is defined. Technico-economical analysis of various kinds of solar energy installations is carried out. It is shown that the use of solar space and water heating systems, solar snow melting installations and even costly photovoltaics are now economically advantageous. The possibility of solar energy utilization in extreme environmental conditions has been demonstrated by pilot solar water heating facility tests at Molodezhnaya Station. (Auth.)

G-50323

Marklund, S., Mäkitalo, L.I., **Base Wasa—Antarctic wastewater treatment and zero discharge** [Antarktisbasen Wasa - Ark-tisk avloppsvattenrening och försök med nollutsläpp], *Vatten*, 1993, Vol.49, p.104-109, With Swedish summary. 5 refs.

Mechanical and biological wastewater treatment were evaluated in a full scale test during the 1991-92 Wasa Base expedition period. The base was erected on a nunatak in the Norwegian antarctic sector and housed 10-20 people. The results indicated that wastewater organics were reduced by a total of 70%. Small changes in other constituents were also detected. Approximately 59 l of wastewater was generated per person per day, including flows from one urinal but not flush toilets, as dry toilets were used. The potential of zero wastewater discharge with solar aided evaporation was tested using primary treated wastewater. Evaporation tests were performed in a preassembled tower, ventilated with solar heated air. During the antarctic summer period, the daily practical evaporation capacity was estimated to be 4-5 l/m² of solar collector surface area per day. (Auth.)

G-50605

Schultz, L.A., Middleton, R.W., Dai, R.Y.T., **Operational performance of the RV Nathaniel B. Palmer**, International Conference on Ships and Marine Structure in Cold Regions, 5th, Calgary, Alberta, Canada, Mar. 1994. Proceedings. ICETECH '94, Society of Naval Architects and Marine Engineers, 1994, p.T1-T27, 6 refs.

This paper summarizes the data obtained for the U.S. Coast Guard from the ship performance tests conducted during the winter 1992 antarctic tests of the *RV Nathaniel B. Palmer*. The objective was to measure the performance of the ship in both open water and ice based on data on environmental and ship operating conditions available from the ship's data collection system, propulsion system data available from the propulsion dynamics test team, and ice properties data available from the ice measurements test team. The open water performance of the ship was evaluated by measuring the calm open water resistance, the resistance in waves, the seakeeping characteristics, the effectiveness of the roll stabilization system, and the open water maneuverability of the ship. The icebreaking performance of the ship was evaluated by measuring the level ice resistance, the resistance in broken ice, the ramming performance of the ship in thick ice, the effectiveness of the heeling system in enhancing the icebreaking

performance of the ship, and the maneuverability of the ship in ice. The operating performance of the *Palmer* was of special interest because of her uniqueness as an icebreaking oceanographic research ship designed for good open water performance, good seakeeping performance, and good icebreaking performance. (Auth. mod.)

G-50607

Yates, J., Cunningham, P., **Transfer of offshore technology from the Arctic to the Antarctic**, International Offshore and Polar Engineering Conference, 3rd, Singapore, June 6-11, 1993. Proceedings. Vol. 1, Golden, CO, International Society of Offshore and Polar Engineers (ISOPE), 1993, p.116-126, 21 refs.

DLC TC1665.I579

This paper addresses the physical and technological difficulties inherent in the extraction of marine hydrocarbons in the polar regions. The factors are then analyzed to assess the potential for the transfer of current and emerging systems of technology from the Arctic to the Antarctic. The paper begins with a review of the physical environment of the polar regions, and the technology currently employed in the Arctic for hydrocarbon exploration. It then analyzes the problems concomitant with the transfer of current and emerging technologies in the Arctic to the Antarctic. (Auth.)

G-50666

U.S. Naval Support Force Antarctica, **Operation Deep Freeze 93/94 end of season report**, June 3, 1994, var. p.

This report describes the military support to the National Science Foundation in conjunction with the U.S. Antarctic Program. The support was provided by various organizations and commands from the Department of Defense and Department of Transportation under the operational control of Commander, U.S. Naval Support Force, Antarctica from Aug. 1993 to Mar. 1994 as Operation DEEP FREEZE 93/94. Within the framework of logistic support of scientific research in Antarctica, the Naval Support Force provided command and control facilities and medical services to McMurdo Station residents and the logistics and communications pipeline for resupply of McMurdo, Amundsen-Scott, Byrd Surface Camp, and other seasonal field camps, plus support for the nearby New Zealand station at Scott Base, the Italian station at Terra Nova Bay, and the Russian station at Vostok. This report provides a summary of significant events during the operating period. The various organizations, units, and commands participating in Operation DEEP FREEZE 93/94 are listed, and their activities and recommendations are described in sufficient detail to provide guidance for future seasons.

G-50700

Kahout, L.L., Merolla, A., Colozza, A., **Solar photovoltaic power system for use in Antarctica**, U.S. National Aeronautics and Space Administration. Technical memorandum, Dec. 1993, NASA-TM-106417, 15p., 2 refs.

A solar photovoltaic power system was designed and built at the NASA Lewis Research Center as part of the NASA/NSF Antarctic Space Analog Program. The system was installed at a remote field camp at Lake Hoare, and provided a six-person field team with electrical power for personal computers and printers, lab equipment, lighting, and a small microwave oven. The system consists of three silicon photovoltaic sub-arrays delivering a total of 1.5 kWe peak power, three lead-acid gel battery modules supplying 2.4 kWe, and an electrical distribution system which delivers 120 Vac and 12 Vdc to the user. The system was modularized for ease of deployment and operation. Previously the camp has been powered by diesel generators, which have proven to be both noisy and polluting. The NSF, in an effort to reduce their dependence on diesel fuel from both an environmental and cost standpoint, is interested in the use of alternate forms of energy such as solar power. Such a power system also will provide NASA with important data on system level deployment and operation in a remote location by a minimally trained crew, as well as validate initial integration concepts. (Auth.)

G-50855

Gill, R.M.F., **Carbon monoxide hazard in sub-antarctic exploration**, *Journal of wilderness medicine*, 1994, 5(1), p.4-10, 26 refs.

During a sub-antarctic expedition, petrol stoves were used for cooking inside tents and snow-holes (snow caves). The carbon monoxide hazard from the use of petrol stoves was assessed by measuring atmospheric levels with direct-reading indicator tubes (Dräger tubes). Levels up to 300 ppm were recorded, higher than previous field experiments have shown. The levels recorded were unlikely to have affected the exercise capacity of expedition members or to have had other serious effects. Direct-reading tubes were a simple and effective means of measurement. One episode of acute serious hazard occurred and is described, but the atmospheric carbon monoxide level was not recorded. It is concluded that the most important hazard from carbon monoxide under mountaineering and exploration conditions is that of acute fatal poisoning. (Auth.)

G-50944

Takahashi, S., Azuma, N., **Plan of Dome-F Station for deep ice-coring by the Japanese Antarctic Research Expedition (JARE)**, Tokyo. *National Institute of Polar Research. Memoirs. Special issue*, Mar. 1994, No.49, International Workshop on Ice Drilling Technology, 4th, Tokyo, April, 20-23, 1993. Proceedings. Edited by O. Watanabe, p.386-395, 2 refs.

A station for deep ice-coring, Dome-F Station, is to be constructed by the Japanese Antarctic Research Expedition (JARE) on top of Dome Fuji (3800 m a.s.l.) in Antarctica, where the minimum temperature is expected to be -88 C and the mean annual temperature is -58 C. The planned station consists of two areas: a residence and a drilling area. The residence area includes living huts and a power station, to be constructed on the snow surface. The drilling area consists of a drilling trench, drill workshop and ice-core and equipment storage trenches buried under the surface. To construct the station and conduct ice-coring operations, 263 t of material must be transported 1000 km by oversnow vehicles from Showa Station to Dome-F. (Auth.)

G-50982

Murao, R., Takeuchi, S., Inaba, M., Hosoya, M., **Operation and evaluation of an experimental hovercraft for antarctic use**, *Antarctic record*, Mar. 1994, 38(1), p.72-111, In Japanese with English summary. 5 refs.

A small (2.8 t) experimental hovercraft was unloaded near Showa Station in Jan. 1981 and left there for testing of performance, maneuverability and maintenance requirements until it was decommissioned in Feb. 1990. It was found that the yaw of this craft was very sensitive under certain ice conditions. Digital simulation of motion was attempted to understand the craft's response to steering. The operation of the experimental hovercraft was evaluated from the viewpoint of support and survey for scientists' activities in the Antarctic. For this purpose, specifications of a hovercraft, parking and storage that are feasible at Showa Station are proposed. (Auth. mod.)

G-51291

Cooper, J., Avenant, N.L., Lafite, P.W., **Airdrops and king penguins: a potential conservation problem at subantarctic Marion Island**, *Polar record*, Oct. 1994, 30(175), p.277-282, 19 refs.

Evidence for the disturbance of king penguins and other seabirds at subantarctic islands by fixed-wing aircraft making airdrops is reviewed. Based on direct observations of panicking birds at king penguin colonies at Marion I. as Lockheed C-130 Hercules aircraft flew past, it is postulated that the incident at Macquarie I. in 1990 when many king penguins were found dead shortly after a flypast was most likely caused by panic induced by the aircraft's passage. Visits by fixed-wing aircraft to subantarctic islands should be kept to a minimum and no airstrips should be built on them. Specific recommendations are given for fixed-wing aircraft visits to Marion I., in order to reduce disturbance to king penguins and other seabirds to the absolute minimum. These recommendations should be adopted at all subantarctic islands. (Auth.)

G-51296

Scientific Committee on Antarctic Research, **SCAR bulletin No.115, October 1994**, *Polar record*, Oct. 1994, 30(175), p.331-334, Stations of SCAR nations operating in the Antarctic, Winter 1994.

This bulletin comprises a three page representation of antarctic winter stations plus an announcement of the availability of the BIOMASS Data Set. The station list is minus one giant from the past: Vostok is not included.

G-51397

Howington, J.P., McFeters, G.A., Smith, J.J., Barry, J.P., **Mapping the McMurdo Station sewage plume**, *Antarctic journal of the United States*, 1992, 27(5), p.330-331, 2 refs.

The authors investigated the spatial distribution and movement of the sewage plume from McMurdo Station and examined ocean currents to determine their effect on the movement of the plume. Samples of seawater were obtained and analyzed for coliform bacteria, high densities of which were found along the circa 1-km shoreline of McMurdo Station, and the plume extended 200-300 m seaward. Relocating the outfall from a surface configuration to the subsurface had little influence on the distribution of the plume, which sometimes reached the seawater intake station 400 m to the south. Ocean current measurements in the study area confirmed that although the prevailing advection was to the north and away from the intake area, episodic reversals of flow at some current-meter stations coincided with pulses of sewage that moved into the intake.

G-51409

Pathak, R.C., Gaikwad, S.S., Deshpande, P.D., Bose, C., **Some geotechnical aspects and construction techniques in the cold regions**, International Symposium on Snow and Related Manifestations, Manali, India, Sep. 26-28, 1994. Extended abstracts, Manali, India, Snow and Avalanche Study Establishment, 1994, p.304-306.

The firm of R & DE (Engrs) Pune over a decade has successfully undertaken construction of various types of accommodation and related structures in the cold regions of the Himalayas as well as in Antarctica. In the present paper the authors briefly enumerate the latest structural techniques for the extreme cold regions and also touch upon the usage of some important available materials for the purpose. (Auth. mod.)

G-51411

Pathak, R.C., Gaikwad, S.S., **Construction of pavements, air-fields and helipads over glacier and snow bound areas**, International Symposium on Snow and Related Manifestations, Manali, India, Sep. 26-28, 1994. Extended abstracts, Manali, India, Snow and Avalanche Study Establishment, 1994, p.327-329.

Construction of airstrips, helipads and snow roads over a glaciated surface poses some complex problems in spite of improved techniques of snow compaction. The problems of maintaining them at relatively high ambient temperatures (0 ± 5 C), when processed snow tends to become cohesionless due to destruction of inter-granular bonds combined with agitation by traffic, is a multidisciplinary area requiring more consistent study. Surface stabilization and covering or reinforcement with composite binder materials are some possible potential solutions. At very low temperatures, e.g. -20 to -40 C, laboratory work and field studies in the Antarctic have revealed that heat or free water must be added to the snow to promote the process of binding of snow grains so as to achieve the desired strength for supporting heavy wheeled aircraft. (Auth.)

See also:

A-49932 B-49858 B-51078 E-49681 E-50426 E-51111 F-49682
F-49937 F-50141 F-50917 F-50931 F-51238 F-51320 F-51487
F-51488 F-51592 I-50150 K-49587 K-50373 K-51015 K-51393
L-49862 L-49863 L-51278

H. MEDICAL SCIENCES

H-49539

Harford, R.R., et al, **Relationship between changes in serum thyrotropin and total lipoprotein cholesterol with prolonged antarctic residence**, *Metabolism: clinical and experimental*, Sep. 1993, 42(9), p.1159-1163, 25 refs.

Antarctic residence (AR) is associated with a 50% increase in the thyrotropin (TSH) response to TSH-releasing hormone (TRH) and an expanded triiodothyronine (T_3) distribution volume and extravascular hormone pool, collectively called the polar T_3 syndrome. To investigate the possible biologic significance of this syndrome, the authors studied the relationship between nonstimulated TSH and serum lipid profiles in 9 subjects, once while in California and monthly during 9 months of AR. Serum levels of TSH, total thyroxine (TT_4), free T_4 (FT_4), total T_3 (TT_3), free T_3 (FT_3), thyroid-binding globulin (TBG), total cholesterol (T-CHOL), high-density lipoprotein cholesterol (HDL-C), triglyceride (TG), dietary cholesterol (D-CHOL), dietary fat (D-FAT), and dietary kilocalories were measured each month. The paired mean monthly change from baseline was used to determine significance. The group's mean levels of TSH (30%), TBG (16%), T-CHOL (4%), HDL-C (10%), and D-CHOL (19%) increased with AR ($P < .05$). Small but significant decreases ($P < .05$) were observed in the mean changes of TT_4 (8%), FT_4 (6%), and TT_3 (6%). FT_3 , D-FAT, dietary kilocalories, body weight, TG, and the calculated low-density lipoprotein (LDL-C) were unchanged with AR. Individual TSH changes with AR for the 9 subjects varied and were highly correlated with paired changes in T-CHOL and similar changes in LDL-C. No correlation was found between D-CHOL and serum lipid levels. The study suggests that AR is associated with asymptomatic environmentally-related thyroid alterations that correlate with metabolic markers (T-CHOL and LDL-C) of thyroid hormone activity on hepatic and adipose tissues. (Auth. mod.)

H-49554

Kerr, G.R.D., Forbes, K.J., Williams, A., Pennington, T.H., **Analysis of the diversity of *Haemophilus parainfluenzae* in the adult human respiratory tract by genomic DNA fingerprinting**, *Epidemiology and infection*, Aug. 1993, 111(1), p.89-98, 31 refs.

A method for typing *Haemophilus* species is described, based on the analysis of genomic DNA from *Haemophilus parainfluenzae*. The DNA was extracted by a rapid method and digested with the restriction enzyme *Bam* HI to provide a characteristic 'fingerprint'. The pattern of fragments in the ranges 1-1.6 kb, 1.6-2 kb and 2-3 kb were used to produce a numerical profile of each isolate. In total 97 isolates were examined; 88 from throat swab material isolated from the 15 members of a British Antarctic Survey base and 9 type strains. Seventy-two of the 88 antarctic isolates were *H. parainfluenzae* and were found to be very diverse, comprising 41 identifiable strains with up to 5 strains being isolated from a single throat swab sample. There was evidence for both carriage and transmission within the isolated community. The technique provided a highly discriminatory method for characterizing *Haemophilus* strains which is suitable for epidemiological studies. (Auth.)

H-49608

Cho, S.H., Han, C.H., Lee, S.B., **Personality characteristics and depression scale of Korean winter-over personnel in isolated antarctic station**, *Korean journal of polar research*, June 1993, 4(1), p.15-25, In Korean with English summary. 16 refs.

Personality changes of 15 wintering-over men were studied using the Minnesota Multiphasic Personality Inventory (MMPI) and Beck's Depression Inventory (BDI) methods. Digital coding of MMPI profiles revealed neurotic tendencies, depression, suspicion, and antisocial behavior in 5 men during the first 3 months. The mean of D (depression) on the MMPI Scale and the mean of the BDI were significantly higher in summer than in winter. (Auth. mod.)

H-49612

Chang, S.K., **Desirable living style for the successful overwin-**

tering at the King Sejong Station, *Korean journal of polar research*, June 1993, 4(1), p.73-85, In Korean with English summary. 17 refs.

Several suggestions and recommendations are made by the author to wintering-over personnel at King Sejong Station, summer parties and visitors, to help them avoid the effects of prolonged isolation in the harsh antarctic environment. They include participation in various sports and games, the study of foreign languages, and sharing of hobbies such as photography or animal observation.

H-49929

Ayton, J.M., **Polar hands: spontaneous skin fissures closed with cyanoacrylate (histoacryl blue) tissue adhesive in Antarctica**, *Arctic medical research*, July 1993, 52(3), p.127-130, 15 refs.

A series of thirteen patients with "polar hands", painful fissuring of fingertips, is documented in antarctic medical practice together with the result of treatment by cyanoacrylate (Histoacryl Blue) human tissue adhesive. Reduction in tenderness and pain allowing improved finger function and a quicker resolution was observed. Cyanoacrylate is a viable adjunct in the treatment of painful superficial finger fissures. (Auth.)

H-50120

Godlee, F., **Walking across Antarctica**, *British medical journal*, Dec. 18-25, 1993, 307(6919), p.1599-1601.

An account is given of the hardships endured by British explorers Dr. Mike Stroud and Sir Ranulph Fiennes, attempting to cross Antarctica in 1993 from the Weddell to the Ross Sea by manhauling sledges across the ice and carrying everything with them, without support of any kind. The responses of the human body under extremes of exercise and starvation, which they recorded, are discussed.

H-50297

Gunderson, E.K.E., Palinkas, L.A., **Psychological studies in the US antarctic program: a review**, *SPRI polar symposia*, 1991, No.1, International Congress of Psychology, 24th, Sydney, AT, Aug. 1988. Symposium on Human Factors in Polar Psychology, edited by A.J.W. Taylor, p.5-8, 20 refs.

Psychological studies were initiated at U.S. antarctic stations during the International Geophysical Year, 1957-58. Attitude and symptom questionnaires, supervisor ratings and sociometric tests were administered to several wintering groups. A more comprehensive program of psychological studies, designed to develop selection criteria for screening antarctic personnel, was instituted in 1962 by the U.S. Navy. A general concept of individual performance or adjustment emerged from earlier studies that included three essential components: task motivation, emotional stability and social compatibility. Two methods, supervisor ratings and peer nominations, were used to measure these three behavior components, and convergent and discriminant validities were evaluated. Regression equations were then developed to predict each behavior factor for each of three occupational groups: Navy construction personnel, Navy administrative and technical personnel, and civilian scientists and technicians. Some of the strengths and weaknesses of this approach for antarctic screening are discussed. Recent studies have focused on the impact of wintering-over stresses on long-term health and adjustment of participants. The winter-over experience does not appear to place Navy personnel at increased risk of hospitalization after their return from the Antarctic. The stressors associated with prolonged isolation in a harsh environment appear to be mediated by personality, and environmental and sociocultural factors. (Auth.)

H-50298

Godwin, J.R., **Preliminary investigation into stress in Australian antarctic expeditioners**, *SPRI polar symposia*, 1991, No.1, International Congress of Psychology, 24th, Sydney, AT, Aug.

1988. Symposium on Human Factors in Polar Psychology, edited by A.J.W. Taylor, p.9-22, 30 refs.

Australian antarctic expeditioners were administered two self-report measures designed to investigate the experience of stress in the antarctic station environment. Responses to a questionnaire based on McGrath's six 'classes' of stress, arising from his three embedding systems of behavior in organizations, identified the social environment as a common source of pressure within the 'Previous Expeditioner' sample. Neither 'Before Departure' nor 'After Arrival' did expeditioners anticipate the degree of pressure arising from this source. There were high correlations between the three samples in rank ordering 12 statements that referred to difficulties, anticipated or experienced, with specific aspects of station life. On the same statements all samples consistently and significantly rated 'Others' as experiencing stress more frequently than 'Self', suggesting a coping strategy based on comparison of self with others. Questionnaire responses were discussed with small groups of expeditioners during field training in Tasmania before departure for Antarctica and at Casey Station after arrival. The results are discussed in relation to the selection, training and management of expeditioners. The study was jointly sponsored by the Antarctic Division and the Department of Defence (Army Office). (Auth.)

H-50299

Rivoli, J., **Recent developments in French polar psychological research**, *SPRI polar symposia*, 1991, No.1, International Congress of Psychology, 24th, Sydney, AT, Aug. 1988. Symposium on Human Factors in Polar Psychology, edited by A.J.W. Taylor, p.23-26, 29 refs.

Participation in the International Biomedical Expedition to the Antarctic led to an interdisciplinary analysis of psychosomatic indicators of stress. Subsequent studies of some 500 files of French winter-over personnel are presented, with focus on 16PF, Rorschach, IP9, MIPG and Life Change material. Studies were also made of traverse personnel in the Antarctic and Arctic. In all of these studies predictions were made, performances were evaluated separately and intercorrelations in search of 'personal styles' were sought, and psychobiological factors were considered. Reference is made also to possible implications for subjects in other exceptional environments. (Auth.)

H-50300

Mocellin, J.S.P., **South American research on human behaviour in the Arctic and Antarctic**, *SPRI polar symposia*, 1991, No.1, International Congress of Psychology, 24th, Sydney, AT, Aug. 1988. Symposium on Human Factors in Polar Psychology, edited by A.J.W. Taylor, p.27-29, 7 refs.

Studies conducted primarily at South American antarctic stations have been oriented to (i) psychological adaptation and coping processes, and (ii) physiological relationships of human and environmental stressors. Results, mostly based on Brazilian studies, indicate that (i) even after a traumatic event, data do not support the classification of the polar environment as being stressful; state anxiety during the arctic and antarctic winters shows normal levels of anxiety; similarity in human responses to the different polar regions was found; (ii) arctic groups are more introverted and higher in sensation-seeking than antarctic groups; (iii) the presence of families in the Antarctic seems to have a positive impact on an isolated group of men, but research in mixed gender, social, and work-group relations is required. (Auth.)

H-50301

Taylor, A.J.W., **Kiwis on ice: New Zealanders in the Antarctic**, *SPRI polar symposia*, 1991, No.1, International Congress of Psychology, 24th, Sydney, AT, Aug. 1988. Symposium on Human Factors in Polar Psychology, edited by A.J.W. Taylor, p.31-34, 19 refs.

A brief account is given of New Zealand's contribution to behavioral science through the participation of subjects who have wintered in Antarctica. Reference is also made to some international projects in which the parameters of performance have come under research scrutiny. The outcome documents some recurrent but transient problems that selection, training and support *in situ* can do much to prevent or alleviate. (Auth.)

H-50302

Suedfeld, P., **Stimulus restriction in the field and laboratory:**

the search for analogies, *SPRI polar symposia*, 1991, No.1, International Congress of Psychology, 24th, Sydney, AT, Aug. 1988. Symposium on Human Factors in Polar Psychology, edited by A.J.W. Taylor, p.35-38, 20 refs.

Laboratory stimulus restriction techniques have long been used as analogs of moving and stationary isolated and confined environments (ICEs) such as spacecraft and polar stations. The analogy was based upon factors of reduced stimulation, social isolation, restricted mobility, and mediating consequences such as stress. Recent research and experience have shown that the environmental parameters in fact seldom cause major stress reactions in the field or the laboratory. The search for appropriate analogies should turn to experiential, rather than strictly environmental, factors. It also appears optimal to disaggregate the analog situation, finding different (possibly nonexperimental) analogies for different aspects of the ICE. This paper also argues for increased awareness of the possibility of beneficial effects, salutogenic outcomes, and the role of experience in such environments as an integrated and integrating part of life. Researchers should broaden their focus beyond the search for negative effects, and use a wider array of data sources, including long-term follow-ups, to test novel hypotheses derived from laboratory research. (Auth.)

H-50303

Harrison, A.A., **Antarctica: prototype for outer space**, *SPRI polar symposia*, 1991, No.1, International Congress of Psychology, 24th, Sydney, AT, Aug. 1988. Symposium on Human Factors in Polar Psychology, edited by A.J.W. Taylor, p.43-49, 31 refs.

Because the natural, constructed, and social environments that are found in Antarctica today closely resemble many of those that we expect to encounter in outer space tomorrow, understanding human behavior in Antarctica is important not only in its own right but because it can provide us with insights into the safety, performance, and quality of life of tomorrow's spacefarers. Steps towards increasing the practical benefits and scientific value of behavioral research in Antarctica include involving both behavioral scientists and operational personnel in research planning, and developing research programs that are objective, theory-driven, and sensitive to historical, organizational, and cultural influences. Antarctica may be a particularly useful setting for selecting and training a crew to work on Mars. Although at present there are more opportunities to study people in Antarctica than in outer space, in the long run those who plan, manage, and participate in antarctic and space programs will benefit from each others' behavioral research. (Auth.)

H-50324

Budd, G.M., **Cold stress and cold adaptation**, *Journal of thermal biology*, Dec. 1993, 18(5/6), p.629-631, 11 refs.

Results from more than half a century of investigation of human adaptation to cold have been so varied that some observers have doubted whether man can adapt to cold at all. This paper considers what challenges to the thermoregulatory system humans experience when living and working in a cold environment (specifically the Antarctic and Subantarctic), what kinds of adaptation have been shown to develop, and what factors might have contributed to the diversity of opinion. (Auth.)

H-50374

Young, B.A., Cosgrove, S.J., Christopherson, R.J., **Thyroid alterations in porcine prolonged exposure to cold or heat**, *U.S. Naval Medical Research Institute. Technical report*, 1992, NMRI-92-130, 27p., ADA-266 840, 24 refs.

Studies by the Naval Medical Research Institute on humans after prolonged antarctic residence have shown possible intracellular thyroid hormone alternations. These studies demonstrated a rise in serum clearance of orally administered triiodothyronine (T3), T3 production and T3 total volume distribution in naval personnel after a 42 week residence in Antarctica compared to a control period in California (21). The increased serum clearance and total pool of T3 indicated a possible intracellular response which could not be further investigated using human subjects. An animal model permitted prolonged confinement of subjects in temperature controlled chambers and the use of radioisotopes to label T3.

H-50395

Postl, B.D., ed, et al, **Circumpolar health 90: Proceedings of the 8th International Congress on Circumpolar Health, White-**

horse, Yukon, May 20-25, 1990, Winnipeg, Canadian Society for Circumpolar Health, 1991, 786p., Refs. passim. For selected papers see H-50396 through H-50399.

DLC RC955.2.I56

This volume is a collection of papers on health related issues in polar regions. Four of the articles are pertinent to Antarctica and deal with improvement of health care at antarctic and subantarctic stations, a review of health research since the International Geophysical Year, ANARE's health register, and a comparison of illness and injury occurrences at either pole.

H-50396

Walton, D.W.H., **Research and improvement of remote health care—an antarctic example**, International Congress on Circumpolar Health, 8th, Whitehorse, Yukon, May 20-25, 1990. Proceedings. Circumpolar health 90, edited by B.D. Postl et al, Winnipeg, Canadian Society for Circumpolar Health, 1991, p.86-89, 13 refs.

DLC RC955.2.I56

The health care system and medical research of the British Antarctic Survey are described. Research projects are selected from four groups: the unexpected incident; specific assessments of field safety criteria; the identification of continuing health care problems; and the use of antarctic environmental features for specialized academic studies. Examples are given for each of these categories.

H-50397

Lugg, D.J., **Humans on ice: a review of research on those living in Antarctica since IGY 1957-58**, International Congress on Circumpolar Health, 8th, Whitehorse, Yukon, May 20-25, 1990. Proceedings. Circumpolar health 90, edited by B.D. Postl et al, Winnipeg, Canadian Society for Circumpolar Health, 1991, p.499-501, 15 refs.

DLC RC955.2.I56

After a short review of the medical publications resulting from research on those living in Antarctica since 1957-58, the author concludes that a creditable research program has evolved which compares favorably with antarctic disciplines, and that it has benefited from international cooperation.

H-50398

Sullivan, P., Gormly, P.J., Lugg, D.J., Watts, D.J., **Australian National Antarctic Research Expeditions Health Register: three years of operation**, International Congress on Circumpolar Health, 8th, Whitehorse, Yukon, May 20-25, 1990. Proceedings. Circumpolar health 90, edited by B.D. Postl et al, Winnipeg, Canadian Society for Circumpolar Health, 1991, p.502-504, 8 refs.

DLC RC955.2.I56

Since 1986, the Australian Antarctic Division has been developing a register to record data on all health events requiring medical consultations at all Australian antarctic stations, field camps and expedition ships. Five particular aspects of the health register are discussed: aims, methods, changes, results and a wider application of this health register than to just the Australian antarctic situation.

H-50399

Norman, J.N., **Comparison of the patterns of illness and injury occurring on offshore structures in the northern North Sea and the stations of the British Antarctic Survey**, International Congress on Circumpolar Health, 8th, Whitehorse, Yukon, May 20-25, 1990. Proceedings. Circumpolar health 90, edited by B.D. Postl et al, Winnipeg, Canadian Society for Circumpolar Health, 1991, p.719-721, 6 refs.

DLC RC955.2.I56

The purpose of this paper is to examine the health related problems which occur in the offshore installations of the oil and gas industry in the North Sea and in the stations of the British Antarctic Survey, and also to examine the system of health care delivery in both of these situations. This type of health care has been described as remote medicine. The principles

are currently being examined by such organizations as the European Space Agency with a view to determining how health care should be delivered at the extreme remoteness of long range space travel and work. It may be that if these principles are adequately defined and discussed they will contribute to the improvement of health care delivery in the smaller but very isolated population groups of the Circumpolar regions.

H-50686

Taylor, D.M., et al, **Energy intake, anthropometry and blood pressure of expeditioners in the Antarctic**, *Arctic medical research*, Apr. 1994, 53(2), p.71-85, 33 refs.

The energy intakes, anthropometry and blood pressure of 62 expeditioners at Macquarie I. and Davis and Casey stations were examined over a 12 month period. High mean energy intakes were found at all stations. Mean subject body weight tended to rise during the winter months and fall during the spring, although there were no significant changes seen at any of the stations over the year. At all stations, blood pressure trended downwards during the year, with significant rises ($p < 0.01$) seen at one station during the spring. Two 12-week dietary intervention periods were introduced during the year at one of the antarctic stations to investigate the effects of low-cholesterol (< 300 mg/day), low-fat ($< 30\%$ of energy) and high-fiber (> 30 g/day) diets. The study confirms earlier reports of high mean energy intake in Antarctica and suggests that the techniques of measuring intake may have been more accurate than those used in large population studies where intake may have been underestimated. The results indicate seasonal fluctuations in blood pressure and anthropometric parameters, and demonstrate that these parameters were affected by the balance of energy intake and activity. (Auth. mod.)

H-50703

Rintamäki, H., et al, **Response to whole body and finger cooling before and after an antarctic expedition**, *European journal of applied physiology and occupational physiology*, 1993, 67(4), p.380-384, 21 refs.

Eight subjects, who were indoor workers and not habitually exposed to cold, spent 53 days in Antarctica. They did mainly geological field work often requiring the use of bare hands. The effects of the expedition on responses to a whole body cold exposure test, a finger blood flow test and a cold pressor test were studied. After the expedition, during whole-body cooling, the time for the onset of shivering was delayed by 36 min ($P < 0.001$) and forearm and thigh temperatures were 1.5 C higher ($P < 0.05$) at the end of exposure. The data would indicate that partial acclimatization to cold had been developed. Changes in forearm temperature were correlated with the duration of cold exposure of the hands ($P < 0.05$), while finger vascular resistance and finger temperature were correlated with responses to cooling before the expedition ($P < 0.001$ and $P < 0.01$, respectively). Because the ambient temperature was not clearly lower in Antarctica in comparison to Finland, the reason for the changes developed seems to be the increased exposure to the outdoor climate in Antarctica. (Auth. mod.)

H-50704

Budd, G.M., et al, **Effects of acclimatization to cold baths on men's responses to whole-body cooling in air**, *European journal of applied physiology and occupational physiology*, 1993, 67(5), p.438-449, Refs. p.448-449.

Human thermoregulatory mechanisms underlying artificial acclimatization to cold were investigated and compared with those of naturally acclimatized men. The main conclusions, and many specific findings, agree with those of two previous studies made by the same techniques in naturally acclimatized men wintering in Antarctica. Other significant findings included changes—in particular reduced thermoneutral rectal temperature and a delayed onset of shivering—that are commonly regarded as evidence of acclimatization but were in fact unrelated to it as they also occurred in the control group. They are attributed to extraneous influences, in particular the relaxation of heightened arousal ('first-time effects') found in the baseline tests. (Auth. mod.)

H-51395

Suedfeld, P., Steel, G.D., Palinkas, L.A., **Psychological aspects of polar living**, *Antarctic journal of the United States*, 1992, 27(5), p.327, 3 refs.

During the austral summer of 1991-1992, two researchers from the PPD distributed almost 200 sets of questionnaires and conducted about 50 interviews at McMurdo Station and Scott Base. The authors have analyzed the results from the NEO Five Factor Inventory (FFI), a short version of the Five Factor Personality Inventory, at McMurdo Station. There were no statistically significant differences between the antarctic sojourners and the representative U.S. sample on which the test was normed. It appears from this early finding that either the recruitment (i.e., self-selection) or the selection procedures, or both, are successful in bringing to McMurdo Station a group that is emotionally stable, i.e. neither depressed nor anxious.

H-51416

Oliveri, M.B., Mautalen, C., Bustamante, L., Gómez García, V., **Serum levels of 25-hydroxyvitamin D in a year of residence on the antarctic continent**, *European journal of clinical nutrition*, June 1994, 48(6), p.397-401, 12 refs.

The authors studied the changes in serum 25-hydroxyvitamin D (25(OH)D) levels in 19 young and healthy men who lived in Antarctica for 1 year. Blood was drawn in the fasting state every 2 months, from Mar. 1990 to Jan. 1991, to determine the serum levels of calcium, alkaline phosphatase and 25(OH)D. Serum calcium did not change significantly throughout the year. Serum alkaline phosphatase levels were not different from the beginning to the end of the year, but autumn and winter levels were lower. The levels of 25(OH)D decreased to about 46% of the initial values and did not increase even with the onset of summer. Further studies should determine the effect of these changes upon calcium-regulating hormones and bone metabolism. (Auth. mod.)

H-51531

Fernández Riestra, F., Contreras Fernández, R., Lisbona Gil, A., **Thyroid alterations in antarctic expeditioners** [Alteraciones en la actividad tiroidea en humanos en la Antártida], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.291-293, In Spanish with English summary. 9 refs.

Adaptation to cold in man is a poorly understood phenomenon. Thyroid hormones play an important role in maintaining basal metabolism and generation of body heat. The authors have studied the participants of the Spanish Antarctic Expedition of 1989-90. Two blood extractions were performed in each person, with a period of twenty-eight days between them. Serum T₃ levels fell slightly but not significantly. Serum total T₄ levels, on the other hand, decreased significantly (p0.03) and TSH levels increased in most of the subjects, showing a significant difference (p0.01). It is concluded that changes in thyroid hormones in men working in Antarctica are related to chronic cold exposure. (Auth.)

H-51532

Lisbona Gil, A., et al, **Mineral metabolism in antarctic expeditioners** [Metabolismo mineral en humanos en la Antártida], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.295-297, In Spanish with English summary. 8 refs.

Mineral and vitamin D metabolism in humans were studied in two groups of subjects from the Spanish Antarctic Expedition of 1988-89. Each group consisted of 11 healthy men, with an oral calcium ingestion of less than 500 mg/day. One group was supplemented with 1.000 UI/day of vitamin D₃. Two samples were obtained during the antarctic summer, with 22 days between them. Serum calcium, phosphorous and magnesium did not show any differences between groups. In the first group, serum 25 (OH)D showed a significant decrease (P<0.01) during the study with no changes in PTH levels. In the supplemented group, a non-significant increase of the 25 (OH)D levels was observed, as well as a significant decrease of the PTH serum (P<0.01). The authors conclude that subjects working in Antarctica must be supplemented with Vitamin D₃, but in doses less than 1.000 UI/day. (Auth.)

H-51533

Lisbona Gil, A., Fernández Riestra, F., **Model for medical evaluation of antarctic expeditioners** [Modelo de valoración médica para expediciones a la Antártida], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.299-300, In Spanish with English summary.

Expeditioners who work in antarctic environments often are exposed to high physical and psychological risk situations, aggravated by evacuation difficulties and limited medical and surgical support. The authors propose a clinical, biochemical and psychological model of examination in order to assure the prior good health status of the members of antarctic expeditions. (Auth.)

H-51606

New Zealand. Ministry of Foreign Affairs and Trade. NZAP, **Antarctic first aid manual**, Christchurch, 1994, 67p.

In 22 sections advice is given for initial treatment of a wide variety of trauma, including accidents, EAR/CPR situations, bleeding and wounds, shock, cold injuries, burns, fractures, sprains, poisoning, wind chill, and eye and skin injuries. Also discussed are dental health, medications, injections, and various medical kits assembled for antarctic conditions.

See also:

A-50296 B-49847 B-50424 B-50529 B-50951 B-50952 B-51427 B-51613 G-50666

I. METEOROLOGY

I-49499

Keller, L.M., Weidner, G.A., Stearns, C.R., **Antarctic automatic weather station data for the calendar year 1991**, Madison, University of Wisconsin, 1993, 356p.

A network of automatic weather station (AWS) units is deployed to collect antarctic surface weather observations in support of specific meteorological research projects as well as operational activities at McMurdo Station. The 1991 network consisted of 33 installed AWS units providing observations on the Ross Ice Shelf, east of the Transantarctic Mountains and north of McMurdo to the Adélie Coast, along the Antarctic Peninsula and at climatological locations such as the South Pole. Each unit measures air temperature, wind speed, and wind direction at a nominal height of 3 m, and air pressure at the electronics enclosure. Some AWS units also measure the relative humidity at 3 m and vertical air temperature difference between 0.5 and 3 m. Monthly and three-hourly data summaries are provided for each AWS unit.

I-49515

Morales, R.G.E., Jara, G.P., Cabrera, S., **Solar ultraviolet radiation measurements by o-nitrobenzaldehyde actinometry**, *Limnology and oceanography*, May 1993, 38(3), p.703-705, 9 refs.

The use of the o-nitrobenzaldehyde actinometer to measure solar UV radiation in clear marine waters has been described (Fleischmann 1989). The low diurnal UV flux reported at the surface of Discovery Bay, Jamaica (18.5N, 77.4W), conflicts with the authors' measurements in San Antonio Bay, Chile (33.6S, 71.6W), and with those of the NSF UV spectroradiometer network in the antarctic region. The solar UV in both hemispheres is compared.

I-49518

Delzeit, L., Rowland, B., Devlin, J.P., **Infrared spectra of HCl complexed/ionized in amorphous hydrates and at ice surfaces in the 15-90 K range**, *Journal of physical chemistry*, Oct. 7, 1993, 97(40), p.10312-10318, 28 refs.

As an effort to clarify the surface chemistry within polar stratospheric clouds, the present study attempts to use the versatile (ice) surface spectroscopy techniques to determine: (a) is there a temperature below which the conversion of ice to the (amorphous) ionic hydrates of HCl is prohibited by energetics/mobility, and (b), at sufficiently low temperature, does the ice surface appear "dry" to an HCl molecule so that the primary interaction is the hydrogen-bonded complex as described in the theoretical study of Kroes and Clary and resembling the 1:1 complex with water in an N₂ matrix? However, to make satisfactory arguments using surface spectroscopy data, the published literature on the crystalline hydrates of HCl must first be supplemented by data for both amorphous and crystalline hydrates of HCl and HBr. This preliminary study is necessary in part because of a deficiency of amorphous-phase data, and in part because of a past failure to recognize the inadvertent inclusion of the amorphous 1:1 hydrate spectra in the published series of infrared spectra of the crystalline HCl and HBr hydrates. (Auth. mod.)

I-49529

Chalikov, D.V., Verbitskii, M.I.A., **Modeling the Pleistocene ice ages**, *Advances in geophysics*. Vol.32, San Diego, Academic Press, 1990, p.75-131, 50 refs.

DLC QC801.A283

This paper presents a physical model of the earth's climate that is based on one-dimensional nonsteady hydrodynamic equations for the ocean, atmosphere, glaciers and asthenosphere. This model covers both polar regions, and includes the principal mechanisms responsible for the formation of global climate, while simulating its evolution for an interval of approx. one million years. (Auth. mod.)

I-49538

Turner, J., Lachlan-Cope, T.A., Warren, D.E., Duncan, C.N., **Mesoscale vortex over Halley Station, Antarctica**, *Monthly weather review*, May 1993, 121(5), p.1317-1336, 25 refs.

A detailed analysis of the evolution and structure of a mesoscale vortex and associated comma cloud that developed at the eastern edge of the Weddell Sea during early Jan. 1986 is presented. The system remained quasi-stationary for over three days close to Halley Station and gave severe weather with gale-force winds and prolonged snow. The formation and development of the system were investigated using conventional surface and upper-air meteorological observations taken at Halley, analyses from the U.K. Meteorological Office 15-level model, and satellite imagery and sounder data from the TIROS-N-NOAA series of polar orbiting satellites. The thermal structure of the vortex was examined using atmospheric profiles derived from radiance measurements from the TIROS Operational Vertical Sounder. Details of the wind field were examined using cloud motion vectors derived from a sequence of Advanced Very High Resolution Radiometer images. The small sea surface-atmospheric temperature differences gave only limited heat fluxes and there was no indication of deep convection associated with the system. The vortex was driven by baroclinic forcing and had some features in common with the baroclinic type of polar lows that occur in the Northern Hemisphere. (Auth. mod.)

I-49549

Kikuchi, T., Endoh, T., **Development of automatic weather stations in the Japanese antarctic climate research program (ACR)**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1993, p.73-82, 8 refs.

Automatic weather stations (AWS) were installed in east Queen Maud Land in order to obtain a multi-year climatic record dating from 1987. After four years of operation of Argos and CMOS AWS, they proved to be useful in the observation of climate parameters and associated weather phenomena. Some preliminary results are reported on the Argos AWS units, which were effective in studying the cause of the "dark stream" in thermal infrared satellite images and in obtaining long-term data. (Auth.)

I-49556

Peng, T.H., **Possible effects of ozone depletion on the global carbon cycle**, *Radiocarbon*, 1992, 34(3), International Radiocarbon Conference, 14th, May 1991. Proceedings. Edited by A. Long, R.S. Kra, F.D. Moskovitz, and J.M. Devine, p.772-779, 22 refs.

The increase of UV-B radiation resulting from ozone depletion is considered to have damaging effects on marine ecosystems. A cutback of marine productivity would tend to reduce the oceanic uptake of atmospheric CO₂. Box models of the global oceans based on the distribution of bomb-produced ¹⁴C are used to evaluate the possible effects of ozone depletion on the atmospheric CO₂ concentration. The maximum effect presumably takes place if the ozone hole reduces the marine productivity to zero in the antarctic ocean. In a business-as-usual scenario of future CO₂ emissions, the atmospheric CO₂ partial pressure (pCO₂) would increase by an additional 37 microatm over the course of the next century. This increase corresponds to 4.6% of the projected atmospheric pCO₂ in the year 2090. However, if the damaging effect caused by the destruction of the stratospheric ozone layer is assumed to lower the productivity over the antarctic ocean by 10%, the atmospheric pCO₂ would rise by less than 3 microatm over the expected atmospheric level in the next century. (Auth.)

I-49557

Koppar, A.L., Kedare, P.L., **Short-term climatology of global solar radiation at Dakshin Gangotri, Antarctica**, *Mausam*, Jan. 1993, 44(1), p.111-114, 1 ref.

Global solar radiation has been measured at the Indian Antarctic Research Station continuously since 1984-85. The station, located on the ice-shelf at 70S, 12E till the summer of 1990, is now located on an exposed site in the Schirmacher Hills about 100 km south of the earlier location. The 7th wintering team occupied the new station in Feb. 1990, and measurement of global solar radiation has been continued at the new site. Thus, in view of the change in the location it is pertinent to work out the short-term climatological normals of mean hourly and mean daily global solar radiation received in different months at the former station, based on 5 years of data from 1984 to 1988. Only the Jan. and Feb. data for 1989 were available and have been included in this study. (Auth. mod.)

I-49567

Bowman, K.P., **Studies of dynamical processes affecting the distribution of stratospheric ozone**, *U.S. National Aeronautic and Space Administration. Contractor report*, July 1993, NASA-CR-193477, 3p., N94-12560.

The purpose of the research is to understand large-scale tracer transport processes in the stratosphere. Two approaches were taken. The first is analysis of tracer observations, especially satellite readings of ozone concentration and total column ozone. The second is numerical simulation of tracer transport processes. Topics researched include: quasi-biennial oscillation (QBO) and stratospheric ozone; mixing in the polar vortices; polar stratospheric clouds (PSC) properties from antarctic lidar data; and statistical methods for numerical experiments. A list of publications developed from this research is also provided.

I-49572

Carrasco, J.F., Bromwich, D.H., **Interannual variation of mesoscale cyclones near the Antarctic Peninsula**, Fourth International Conference on Southern Hemisphere Meteorology and Oceanography, Hobart, Mar. 29-Apr. 2, 1993. Preprint volume, Boston, American Meteorological Society, 1993, p.499-500, 8 refs.

Previous studies have already revealed interannual variability in the spatial distribution of mesoscale cyclones around the Antarctic Peninsula; this interannual variability is investigated in this article. The Southern Hemisphere numerical analyses produced by the Australian Bureau of Meteorology are used to infer the large-scale environment surrounding the Antarctic Peninsula. The interannual variability of mesoscale cyclones may be linked to the interannual variation of the circumpolar trough in the vicinity of the Peninsula. The intensity of the quasi-stationary low pressure area influences the warm air advection on both sides of the Peninsula. The location of the maximum frequency of mesocyclones over the Bellingshausen Sea sector is located to the north of latitude 70S for Sep. 83-Feb. 84, while the more homogeneous distribution in Aug. 89-Feb. 90 extends equatorward from latitude 75S. This indicates that the spatial frequency distribution of mesoscale cyclones is related to the average position of the NLSI. A meteorological phenomenon that distinguishes the two sides of the Antarctic Peninsula is the cold low-level southerly airflow which is frequently observed along the east side of the Peninsula. Further studies are needed to determine the effect of such boundary-layer cold air advection upon mesoscale cyclogenesis over the western side of the Weddell Sea.

I-49574

Tzeng, R.Y., Bromwich, D.H., Parish, T.R., **NCAR CCM2 simulation of the modern antarctic climate**, Fourth International Conference on Southern Hemisphere Meteorology and Oceanography, Hobart, Mar. 29-Apr. 2, 1993. Preprint volume, Boston, American Meteorological Society, 1993, p.459-460, 3 refs.

The CCM2 (Community Climate Model) has a markedly improved simulation of antarctic climate over the CCM1. For instance, the CCM2 can adequately simulate katabatic winds, surface air temperatures, the split jet stream over New Zealand in winter, and the very arid climate over the interior of the continent. By contrast, the model cannot properly simulate the annual and semiannual variations, the intensity of the circumpolar trough, or subtropical anticyclones. However, the higher horizontal resolution and the semi-Lagrangian transport scheme have corrected some serious problems found in the CCM1.

I-49575

Bromwich, D.H., Robasky, F.M., **Recent precipitation trends over the polar ice sheets**, *Meteorology and atmospheric physics*, 1993, Vol.51, p.259-274, Refs. p.272-274.

Meteorological and glaciological analyses are integrated to examine the precipitation trends during the last three decades over the ice sheets covering Antarctica and Greenland. For Antarctica, the best data source is provided by glaciologically-measured trends of snow accumulation, and for limited sectors of East Antarctica consistency with precipitation amounts calculated from the atmospheric water balance equation is obtained. For Greenland, precipitation rates parameterized from atmospheric analyses yield the only comprehensive depiction. The precipitation rate over Antarctica appears to have increased by about 5% over a time period spanning the accumulation means for the 1955-65 to 1965-75 periods, while over Greenland it has decreased by about 15% since 1963 with a secondary increase over the southern part of the ice sheet starting in 1977. At the end of the 10-year overlapping period, the global sea-level impact of the precipitation changes over Antarctica exceeds that for Greenland and yields a net ice-sheet precipitation contribution of roughly -0.2mm/yr. These changes are likely due to marked variations in the cyclonic forcing affecting the ice sheets, but are only weakly reflected in the temperature regime, consistent with the episodic nature of cyclonic precipitation. (Auth. mod.)

I-49629

Liu, S.H., Xiong, K., **Radiation balance and turbulent flux characteristics over Mizuho Station in Antarctica**, *Acta meteorologica sinica*, 1993, 7(3), p.316-326, 7 refs.

In this paper, by using previous measurements in micrometeorology and radiation balance in the surface layer, the authors have analyzed the diurnal and annual variation characteristics of radiation balance in spring, summer, autumn and winter over Mizuho Station, and calculated the momentum flux and sensible heat flux with the aerodynamic method and profile gradient alternate method in different seasons. Also obtained were diurnal variations of the latent heat flux from the equation for energy balance. The results from the calculations are compared. Finally, the relationship between the turbulent heat and momentum exchange coefficient and the diurnal variation of the Richardson number are discussed. (Auth. mod.)

I-49630

Rasmussen, E.A., **Northern and southern hemispheric polar lows—a comparative study**, *Acta meteorologica sinica*, 1993, 7(3), p.355-366, 28 refs.

Northern Hemispheric polar lows, i.e. maritime small but fairly intense cyclonic systems, have been studied for more than two decades. Recently researchers have turned their attention towards the occurrence of polar lows and other small-scale cyclonic disturbances in the Southern Hemisphere. In this paper a short account of present knowledge of Northern Hemispheric polar lows will be given, followed by some preliminary results of an investigation of the nature and occurrence of polar lows in the Southern Hemisphere, including the antarctic region. (Auth. mod.)

I-49642

Gallée, H., Schayes, G., Berger, A., **Development of a 3-dimensional meso-gamma primitive equations model: katabatic winds simulation in the area of Terra Nova Bay, Antarctica**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.3, Brussels, Belgian Science Policy Office, 1993, 36p., 41 refs.

The spatial evolution of antarctic katabatic winds in the area of Terra Nova Bay is examined using the three-dimensional version of the UCL/MAR mesoscale primitive equation model. The ability of the model to replicate classical linear and nonlinear mountain waves simulations is verified. A three-dimensional experiment is then performed using the terrain configuration of Terra Nova (Ross Sea coastal zone). Because of computational requirements, the resolution is chosen to be 5 km. Results are in good agreement with available observations and previous modeling work. In particular, the high resolution allows the model to represent the katabatic jet over Terra Nova Bay. (Auth.)

I-49651

Chen, R.R., Boyer, D.L., Tao, L.J., **Laboratory simulation of atmospheric motions in the vicinity of Antarctica**, *Journal of the atmospheric sciences*, Dec. 15, 1993, 50(24), p.4058-4079, 28 refs.

This paper examines the extent to which a laboratory model can be developed for both the drainage flows and the accompanying general atmospheric circulation above Antarctica. (Auth. mod.)

I-49653

Williams, L.R., Golden, D.M., **Solubility of HCl in sulfuric acid at stratospheric temperatures**, *Geophysical research letters*, Oct. 22, 1993, 20(20), p.2227-2230, 20 refs.

In an experiment designed to clarify nucleation processes implicated in antarctic ozone attenuation, the solubility of HCl in sulfuric acid was measured using a Knudsen cell technique. Effective Henry's law constants are reported for sulfuric acid concentrations between 50 and 60 weight percent and for temperatures between 220 and 230 K. The measured values indicate that very little HCl will be dissolved in the stratospheric sulfate aerosol particles.

I-49656

Waugh, D.W., **Subtropical stratospheric mixing linked to disturbances in the polar vortices**, *Nature*, Oct. 7, 1993, 365(6446), p.535-537, 17 refs.

Other researchers have observed tongues of stratospheric air stretching from the tropics into middle latitudes, and conclude that such events may be responsible for transporting significant amounts of stratospheric air across the tropical-mid-latitude barrier. Examined here are the movements of air parcels during these events using high-resolution contour-trajectory calculations. Calculations suggest that the tongues of tropical air are associated with disturbances of the stratospheric polar vortices. The edge of the disturbed polar vortex reaches low latitudes, and draws a long tongue of tropical air around the vortex into middle latitudes. This process occurs in the winter of both hemispheres, although the edge of the larger antarctic polar vortex reaches farther toward the equator, and draws up material from lower latitudes, than does its arctic counterpart. (Auth.)

I-49657

Randel, W.J., et al, **Stratospheric transport from the tropics to middle latitudes by planetary-wave mixing**, *Nature*, Oct. 7, 1993, 365(6446), p.533-535, 23 refs.

Transport of air from the troposphere to the stratosphere takes place mainly in the tropics. The question is raised as to how stratospheric material that has been transported from the troposphere is subsequently conveyed to higher latitudes. Presented here are global maps of nitrous oxide and water mixing ratios obtained by the Upper Atmosphere Research Satellite. Strong latitudinal gradients are seen in these trace species, confirming the existence of a barrier to transport. But superimposed on this background structure are planetary-scale 'tongues' of tropical stratospheric air extending out into middle latitudes, and time sequences show irreversible mixing from the tropics into middle latitudes. Such episodes could be responsible for transporting significant quantities of stratospheric air across the tropical barrier. Accompanying graphs pictorially show the transport of air from the tropical stratosphere to near 80S. (Auth. mod.)

I-49662

Gruzdev, A.N., Mokhov, I.I., **Quasi-biennial oscillations in the total ozone global field from ground based observations**, *Izvestiya, Russian Academy of Sciences, atmospheric and oceanic physics*, Dec. 1992, 28(5), p.358-366, Translated from *Izvestiia. Fizika atmosfery i okeana*. 36 refs.

Average monthly data from total ozone content (TOC) measurements at stations of a worldwide ozone measuring network for 1972-1988 are analyzed. Spectral analysis by the maximum-entropy method showed that the TOC spectra are bimodal in the frequency range of the quasi-biennial oscillation with spectral maxima corresponding to 17-23 months (short period) and 28-35 months (long period), varying from station to station. TOC variations in the long period predominate over a significant part of the northern and southern hemispheres; oscillations in the short period are tentatively attributed to the interaction of "true" quasi-biennial oscillations

with a one-year cycle. The spatial distribution and interseasonal evolution of quasi-biennial anomalies of the TOC, determined by multiyear average seasonal difference of the TOC values in phases of the western and eastern equatorial wind at a 50 mbar level, are analyzed. Regions of special evolution of this difference, in particular in Antarctica, in connection with the effect of the ozone hole, were found. The anomalies are generally positive in the tropical belt and negative at extratropical latitudes in both hemispheres. (Auth. mod.)

I-49677

Zhang, R.Y., Wooldridge, P.J., Abbatt, J.P.D., Molina, M.J., **Physical chemistry of the H₂SO₄/H₂O binary system at low temperatures: stratospheric implications**, *Journal of physical chemistry*, July 15, 1993, 97(28), p.7351-7358, 49 refs.

Laboratory experiments have been carried out to investigate the physical chemistry of the H₂SO₄/H₂O binary system under conditions characteristic of the stratosphere. Water vapor pressures of sulfuric acid solutions (20-70 wt%) and of liquid-solid and solid-solid phase coexistence systems were measured by mass spectrometry at temperatures between 190 and 240 K. Infrared spectra of the liquid, supercooled liquid, and crystalline hydrates of this system were also investigated. The results indicate that some of the hydrates of sulfuric acid may form and persist under the temperature and water partial pressure conditions typical of the high-latitude stratosphere. (Auth. mod.)

I-49678

Lee, T.J., Rendell, A.P., **Ab initio characterization of ClOOH: implications for atmospheric chemistry**, *Journal of physical chemistry*, July 8, 1993, 97(27), p.6999-7002, 34 refs.

In an effort to clarify the role of chlorine in polar atmospheric chemistry, the equilibrium structure, dipole moment, harmonic vibrational frequencies, and infrared intensities of ClOOH are determined using the electronic structure method. The heat of formation of ClOOH is determined (using two different isodesmic reactions) to be +1.5 +/- 1 kcal/mol at 0 K or +0.2 +/- 1 kcal/mol at 298.15 K. Using the computed heat of formation, the authors examined the stability of ClOOH with respect to the ClO + OH, ClOO + H, and HOO + Cl dissociation limits. Since ClOOH is found to be quite stable, it is argued that the chemistry of ClOOH should be included in any accurate modeling of the stratosphere. (Auth. mod.)

I-49693

Wendler, G., **Strong gravity flow observed along the slope of eastern Antarctica—a contribution to I.A.G.O.**, *Meteorology and atmospheric physics*, 1990, 43(1-4), p.127-135, Paper presented at International Conference on Mountain Meteorology and ALPEX, Garmisch Partenkirchen, Germany, June 5-9, 1989. 33 refs.

The winds observed in Adélie Coast, East Antarctica, are among the strongest observed anywhere on earth close to sea level. However, little was known until recently about the inland wind conditions, with the exception of short term traverse data collected mostly during summers. Automatic Weather Stations reporting over satellites made year-round data gathering possible over a much larger area, and an array of stations, stretching from Dumont d'Urville to Dome C, some 1,080 km inland and at a height of 3,280 m, were established in a US-French experiment. Some of the findings are the following: 1) the maximum wind speed was found not at the coast, but some distance inland. 2) The wind directional constancy was high, even during summer, when the surface inversion is normally destroyed around noon. Only Dome C, where no gravity flow can exist, displayed a large variability in wind direction. 3) During winter and night when gravitational acceleration is large, a larger downslope component in the wind direction was observed, while during summer and daytime a larger cross-slope component is present. (Auth. mod.)

I-49694

Pettré, P., et al, **Study of the influence of katabatic flows on the antarctic circulation using GCM simulations**, *Meteorology and atmospheric physics*, 1990, 43(1-4), p.187-195, Paper presented at International Conference on Mountain Meteorology and ALPEX, Garmisch Partenkirchen, Germany, June 5-9, 1989. 14 refs.

A one-dimensional analytical model of katabatic wind over Antarctica has been developed. This parametric model is derived from the bulk two-layer model of Ball including the surface friction and taking into account the earth's rotation and the geostrophic wind in the upper layer. The model is validated using the data set (70 soundings) collected 110 km inland from Adélie Coast. The parametric model is then introduced into a GCM which is a spectral global version of the operational numerical weather prediction model used by the French weather service. The most significant effect of the parameterization is a 50 m increase of the geopotential height over the South Pole. The surface temperature at the South Pole increases (2 C) reducing the pole-midlatitude thermal gradient. The westerly circulation at 50S is slowed down (4 m/s at 850 hPa), and the surface pressure at the South Pole increases (4 hPa). (Auth. mod.)

I-49695

Liu, Z., Bromwich, D.H., **Acoustic remote sensing of planetary boundary layer dynamics near Ross Island, Antarctica**, *Journal of applied meteorology*, Dec. 1993, 32(12), p.1867-1882, 23 refs.

An acoustic sounder (sodar) was deployed during the 1990-91 austral summer season at Williams Field in the upwind area south of Ross I. Such equipment can continuously measure three-dimensional winds from a few tens of meters above the surface up to an altitude of several hundred meters, thus providing a new opportunity to study the dynamics of the stably stratified planetary boundary layer. In addition to confirming earlier work, the sodar winds show a significant diurnal variation of the blocking effect, which amplifies with height. Such variation is dominated by the changes in the upstream air mass in which katabatic airflow from Byrd, Mulock, and Skelton glaciers plays a central role. Through case studies, the breakdown of the prevailing wind regime in the Ross I. area was associated with the influence of meso- and synoptic-scale pressure gradients on the katabatic airflow approaching from the south and with very localized geostrophic winds deflected around the topography of Ross I. (Auth. mod.)

I-49697

Nakazawa, T., et al, **Measurements of CO₂ and CH₄ concentrations in air in a polar ice core**, *Journal of glaciology*, 1993, 39(132), p.209-215, 26 refs.

Dry and wet air-extraction systems and precise analysis systems of the CO₂ and CH₄ concentrations for a polar ice core were developed to reconstruct their ancient levels. A dry-extraction system was capable of crushing an ice sample of 1000 g into fine powder within 2 min, and its air-extraction efficiency was found to be 98%. The CO₂ and CH₄ concentrations of extracted air were determined using gas chromatography with a flame-ionized detector. The overall precision of the measurements, including air extraction, was estimated to be better than +/- 1 ppmv for CO₂ and +/- 10 ppbv for CH₄. Preliminary analysis of the ice core drilled at Mizuho Station showed that the CO₂ and CH₄ concentrations at 3340-3700 year BP were about 280 ppmv and 700 ppbv, respectively. The Yamato core drilled at the terminus of the glacial flow near the Yamato Mountains yielded concentrations of 230-240 ppmv for CO₂ and 520-550 ppbv for CH₄, suggesting that the core had formed during the glacial period. (Auth.)

I-49702

Ledroit, M., Rémy, F., Minster, J.F., **Observations of the antarctic ice sheet with the Seasat scatterometer: relation to katabatic-wind intensity and direction**, *Journal of glaciology*, 1993, 39(132), p.385-396, 27 refs.

The Seasat A satellite scatterometer radar, initially designed to measure ocean-wind intensity and direction, also has provided observations on the antarctic ice sheet. The signal of the backscatter coefficient decreases strongly from 10 to -20 dB when the incidence angle of the observations increases from 0 to 65 deg. An additional 5 dB signal is found, which is correlated with the direction and intensity of katabatic winds, independent of the incidence angle and polarization of the signal. By using simplified models of the volume-scattering within the snowpack (which is mostly sensitive to snow grain-size) and surface scattering from the air-snow interface (which depends on roughness), it is evident that the signal of the scatterometer could result from the effects of snow dunes at low incidence

angle, and of micro-roughness and volume backscatter at incidence angles greater than 25 deg. The instrument therefore provides a means of measuring the direction and intensity of katabatic winds. (Auth. mod.)

I-49706

Podolske, J.R., Loewenstein, M., **Airborne tunable diode laser spectrometer for trace-gas measurement in the lower stratosphere**, *Applied optics*, Sep. 20, 1993, 32(27), p.5324-5333, 35 refs.

This paper describes the airborne tunable laser absorption spectrometer, a tunable diode laser instrument designed for *in situ* trace-gas measurement in the lower stratosphere from an ER-2 high-altitude research aircraft. Laser-wavelength modulation and second-harmonic detection are employed to achieve the required constituent detection sensitivity. The airborne tunable laser absorption spectrometer was used in two polar ozone campaigns, the Airborne Antarctic Ozone Experiment and the Airborne Arctic Stratospheric Expedition, and measured nitrous oxide with a response time of 1 s and an accuracy within 10%. (Auth.)

I-49724

Troy, C.T., **Laser ice probe aids ozone study**, *Photonics spectra*, Nov. 1993, 27(11), p.39-42.

This note describes an experimental technique in which a laser beam illuminates a frozen ice sample in a vacuum chamber. Spectral fluctuations in the reflected beam convey the chemical composition of the ice sample. By revealing the chemical properties of such samples as they are varied to simulate nucleation processes in the polar stratosphere, these experiments elucidate the attenuation of atmospheric ozone in the polar regions.

I-49731

Ito, T., **Antarctic ozone hole: recent topics**, *Polar news*, Mar. 1993, No.56, p.49-55, In Japanese.

The chemical reactions which form the ozone hole over Antarctica every spring are discussed and ozone fluctuations, continent-wide for 1979-1991 and at Showa Station for 1991 and 1992, are summarized. Originally it was suggested that chlorofluorocarbons (CFCs) were the main contributors to ozone depletion, but now it is suggested that heterogeneous chemical reactions of chlorine on the surface of nitric acid trihydrate particles in polar stratospheric clouds (PSCs) are the main contributors. Graphs are included showing fluctuations of the ozone hole in area, in milli-atmo-centimeters (m atm-cm), that is, what the thickness of the ozone layer would be in thousandths of a centimeter at sea level, and in mega metric ton (Mt) losses. The ozone hole in 1991 was the largest observed so far, with an area of 17.4 million sq km, an ozone level of 108 m atm-cm (the global average is about 300 m atm-cm), and an ozone loss of 55.4 Mt. At Showa Station, the lowest levels in 1991 and 1992 were 145 m atm-cm and 140 m atm-cm, where the previous lowest was 150 m atm-cm in 1987.

I-49738

Aoki, S., **Variations of tropospheric ozone concentration at Syowa Station**, *Polar news*, Aug. 1993, No.57, p.52-55, In Japanese.

Variations of tropospheric ozone concentrations at Showa Station, Feb. 1988-Feb. 1992, are summarized. The average annual concentrations for 1988, 1989, 1990, and 1991, were 26.8, 25.2, 26.9, and 24.5 parts per billion by volume (ppbv), ranging normally between about 15 and 35 ppbv, but with extreme low concentrations in Sep. of each year of less than 10 ppbv. Graphs are included showing the variations in ppbv and Dobson units.

I-49745

Rasmussen, E.A., Turner, J., Twitchell, P.F., **Report of a workshop on applications of new forms of satellite data in polar low research**, *American Meteorological Society. Bulletin*, June 1993, 74(6), p.1057-1073, 26 refs.

A workshop on applications of new forms of satellite data in polar low research was held in Hvanneyri, Iceland, June 23-26, 1992, primarily to discuss the use of "non standard" satellite data such as microwave data, TOVS profiles, and scatterometer surface wind data in polar low research. The workshop reflected that polar lows are a global phenomenon and that polar low research currently is carried out by many groups or individuals

focusing on different parts of the world. The focus at the workshop was almost equally divided between Southern and Northern Hemisphere developments, and representative case studies for each hemisphere were discussed. Several of the case studies considered were based mainly or exclusively on "new" forms of satellite data. The possible importance of polar lows as a mechanism for deep ocean water formation near Greenland and Labrador was also discussed. (Auth.)

I-49746

Chu, L.T., Leu, M.T., Keyser, L.F., **Heterogeneous reactions of HOCl + HCl - Cl₂ + H₂O and ClONO₂ + HCl - Cl₂ + HNO₃ on ice surfaces at polar stratospheric conditions**, *Journal of physical chemistry*, Dec. 9, 1993, 97(49), p.12,798-12,804, 32 refs.

This work reports a new measurement of the reaction probability for reactions at 188 K using partial pressures of reactants similar to those in the polar atmosphere. After a brief description of the experimental procedures used in the reaction probability determination, experimental results are presented and the effect of ice-film morphology on these results is discussed and compared with previous measurements. Finally, reaction mechanisms for these heterogeneous reactions on ice surfaces are briefly discussed. (Auth. mod.)

I-49747

Hanson, D.R., Ravishankara, A.R., **Reaction of ClONO₂ with HCl on NAT, NAD, and frozen sulfuric acid and hydrolysis of N₂O₅ and ClONO₂ on frozen sulfuric acid**, *Journal of geophysical research*, Dec. 20, 1993, 98(D12), p.22,931-22,936, 19 refs.

The reaction of ClONO₂ with HCl on nitric acid trihydrate (NAT) and dihydrate (NAD) and on frozen sulfuric acid solutions was studied as functions of reactant concentration and temperature representative of the stratosphere. A flow tube reactor equipped with a chemical ionization mass spectrometer detector was used. The measured reactive uptake coefficient shows a strong dependence on temperature at constant H₂O partial pressure. The hydrolysis of N₂O₅ and ClONO₂ on frozen sulfuric acid was measured to be far less efficient than that in liquid solutions. The implications of these results to the heterogeneous chemistry of the stratosphere are discussed. The work relates to antarctic polar stratospheric clouds. (Auth. mod.)

I-49748

Burkholder, J.B., Talukdar, R.K., Ravishankara, A.R., Solomon, S., **Temperature dependence of the HNO₃ UV absorption cross sections**, *Journal of geophysical research*, Dec. 20, 1993, 98(D12), p.22,937-22,948, 15 refs.

The temperature dependence of the HNO₃ absorption cross sections between 240 and 360 K over the wavelength range 195 to 350 nm has been measured using a diode array spectrometer. Absorption cross sections were determined using both absolute pressure measurements at 298 K and a dual absorption cell arrangement in which the absorption spectrum at various temperatures is measured relative to the room temperature absorption spectrum. The HNO₃ absorption spectrum showed a temperature dependence which is weak at short wavelengths, but stronger at the longer wavelengths which are important for photolysis in the lower stratosphere. Absorption cross section data are compared with the previous measurements of both room temperature and temperature-dependent absorption cross sections. Temperature-dependent absorption cross sections of HNO₃ are recommended for use in atmospheric modeling. These temperature dependent HNO₃ absorption cross sections were used in a two-dimensional dynamical-photochemical model to demonstrate the effects of the revised absorption cross sections on loss rate of HNO₃ and the abundance of NO₂ in the stratosphere. The work is relevant to polar stratospheric clouds. (Auth. mod.)

I-49749

Thomason, L.W., Poole, L.R., **Use of stratospheric aerosol properties as diagnostics of antarctic vortex processes**, *Journal of geophysical research*, Dec. 20, 1993, 98(D12), p.23,003-23,012, 44 refs.

Physical properties of the stratospheric aerosol population are inferred from cloud-free SAGE II (Stratospheric Aerosol Gas Experiment) multiwavelength extinction measurements in the Antarctic during late summer (Feb./Mar.) and spring (Sep./Oct., Nov.). Seasonal changes in

these properties are used to infer physical processes occurring in the antarctic stratosphere over the course of the winter. The analysis suggests that the apparent springtime cleansing of the antarctic stratosphere is the result of aerosol redistribution through subsidence of the polar vortex air mass and sedimentation of large polar stratospheric cloud particles. The analysis also suggests that vortex processes are responsible for a significant downward transport of aerosol through the tropopause. (Auth. mod.)

I-49750

Bowman, K.P., **Large-scale isentropic mixing properties of the antarctic polar vortex from analyzed winds**, *Journal of geophysical research*, Dec. 20, 1993, 98(D12), p.23,013-23,027, 25 refs.

Winds derived from analyzed geopotential height fields are used to study quasi-horizontal mixing by the large-scale flow in the lower stratosphere during austral spring, the period when the antarctic ozone hole appears and disappears. Trajectories are computed for large ensembles of particles initially inside and outside the main polar vortex. Mixing and transport are diagnosed through estimates of finite time Lyapunov exponents and Lagrangian dispersion statistics of the tracer trajectories. At 450 K and above, prior to the vortex breakdown, Lyapunov exponents are a factor of 2 smaller inside the vortex than outside; diffusion coefficients are an order of magnitude smaller inside than outside the vortex; and the trajectories reveal little exchange of air across the vortex boundary. At lower levels (425 and 400 K), mixing is greater and there is substantial exchange of air across the vortex boundary. In some years there are large wave events that expel small amounts of vortex air into the mid-latitudes. At the end of the spring season during the vortex breakdown there is rapid mixing of air across the vortex boundary, which is evident in the mixing diagnostics and the tracer trajectories. (Auth. mod.)

I-49751

Elson, L.S., Froidevaux, L., **Use of Fourier transforms for asymptotic mapping: applications to the Upper Atmosphere Research Satellite Microwave Limb Sounder**, *Journal of geophysical research*, Dec. 20, 1993, 98(D12), p.23,039-23,049, 14 refs.

Fourier analysis has been applied to data obtained from limb viewing instruments on the Upper Atmosphere Research Satellite. A coordinate system rotation facilitates the efficient computation of Fourier transforms in the temporal and longitudinal domains. Fields such as ozone (O₃) chlorine monoxide (ClO), temperature, and water vapor have been transformed by this process. The transforms have been inverted to provide maps of these quantities at selected times, providing a method of accurate time interpolation. Maps obtained by this process show evidence of both horizontal and vertical transport of important trace species such as O₃ and ClO. An examination of the polar regions indicates that large-scale planetary variations are likely to play a significant role in transporting mid-stratospheric O₃ into the polar regions. There is also evidence that downward transport occurs, providing a means of moving O₃ into the polar vortex at lower altitudes. The transforms themselves show the structure and propagation characteristics of wave variations. (Auth. mod.)

I-49752

Pitari, G., Rizi, V., Ricciardulli, L., Visconti, G., **High-speed civil transport impact: role of sulfate, nitric acid trihydrate, and ice aerosols studied with a two-dimensional model including aerosol physics**, *Journal of geophysical research*, Dec. 20, 1993, 98(D12), p.23,141-23,164, 58 refs.

This paper presents a comprehensive study of sulfur, aerosol, PSC (polar stratospheric clouds) and ozone interactions. A two-dimensional model of the atmosphere is used to calculate the atmospheric chemical composition, including the distribution of sulfur compounds. A microphysical code is coupled to this model so that the particulate component may also be interactively calculated: the latter includes sulfate, nitric acid trihydrate (NAT) and ice aerosols. A simple statistical approach is used to take into account large-scale zonal asymmetries of the temperature field. This rather comprehensive approach is used to study how perturbations in the sources of sulfur compounds introduced by high-speed civil transport aircraft feed back into the sulfate aerosol layer and how this perturbation affects the ozone chemistry. Changes of the aerosol concentration coupled

with water vapor and nitric acid concentration changes will affect NAT and ice total surface and occurrence, so that this study gives for the first time a quantitative estimate of all these feedbacks. (Auth. mod.)

I-49753

Zaitseva, N.A., ed, Khattatov, V.U., ed, **Atmospheric ozone study (Ozone-90)** [Issledovanie atmosfernogo ozona (Ozon-90)], Moscow, Gidrometeoizdat, 1992, 172p., In Russian with English summary. Refs. passim. For selected papers see 48-2484 through 48-2496 or I-49754 through I-49757.

This is a collection of papers devoted to the work conducted within the framework of "A National Program of the Ozone Layer Studies and Observations during 1989-1995," adopted by Resolution No. 159 (20 Mar. 1989) of the USSR State Committee for Science and Technology. Long-term total ozone variations (1957-1986) are analyzed. Characteristic features of total ozone dynamics in this region, based on antarctic total ozone observations, are shown. To account for the ozone minimum over Antarctica during spring, a photochemical mechanism of ozone and polar stratospheric cloud (PSC) interaction is suggested. A numerical model of PSCs is also described. (Auth. mod.)

I-49754

Radionov, V.F., Sveshnikov, A.M., **Dynamics of total ozone content in Antarctica** [Dinamika obshchego soderzhaniia ozona v Antarktike], Issledovanie atmosfernogo ozona (Ozon-90) (Atmospheric ozone study (Ozone-90)). Edited by N.A. Zaitseva and V.U. Khattatov, Moscow, Gidrometeoizdat, 1992, p.20-24, In Russian with English summary. 2 refs.

Interannual and interseasonal changes in total ozone content measured in Antarctica are considered. The minimum and maximum of annual variations in total ozone are observed in Sep. and in Oct.-Nov., respectively. The total ozone content values during the maximum vary from year to year, which is attributed to the process of the atmospheric vortex destruction in springtime. Diagrams of total ozone content changes in the winter-spring period of 1987-1989 are given. The period of the largest variations of mean daily values of total ozone started later in 1989 than in 1988. (Auth. mod.)

I-49755

IUrganov, L.M., **Measurements of ozone concentration in the atmospheric boundary layer over the Weddell Sea, Antarctica** [Izmereniia kontsentratsii ozona v prizemnom sloe atmosfery nad morem Ueddela (Antarktika)], Issledovanie atmosfernogo ozona (Ozon-90) (Atmospheric ozone study (Ozone-90)). Edited by N.A. Zaitseva and V.U. Khattatov, Moscow, Gidrometeoizdat, 1992, p.34-37, In Russian with English summary. 2 refs.

Data on ozone concentration measurements at the surface atmospheric layer over the Weddell Sea are analyzed. The measurements were conducted with a chemiluminescent analyzer on board the research icebreaker *Polarstern* in Sep.-Oct. 1989. The variations of ozone concentrations were compared with data from synoptical analysis, and a correlation with circulation features was revealed. (Auth. mod.)

I-49756

Zhadin, E.A., **Influence of wave activity on anomalous changes in the ozone layer** [Vliianie volnovoi aktivnosti na anomal'nye izmeneniia ozonnogo sloia atmosfery], Issledovanie atmosfernogo ozona (Ozon-90) (Atmospheric ozone study (Ozone-90)). Edited by N.A. Zaitseva and V.U. Khattatov, Moscow, Gidrometeoizdat, 1992, p.58-65, In Russian with English summary. 21 refs.

Analysis of experimental data on ozone variability over Halley, Showa and Amundsen-Scott stations in Aug.-Sep. 1987 showed that an ozone decrease over the South Pole begins in late Aug. during the antarctic polar night. This is not in agreement with the results of the hypothesis on its association with sunrise. A simple mechanism of ozone and temperature quasibiennial oscillation in high latitudes is proposed. Using a planetary wave model, the influence of sea surface temperature variations on the eddy ozone coefficients is calculated. These results point to the possible

connection between supposed long term changes in the geographical positions of the world ocean's warm streams and observed interannual ozone anomalies in the atmosphere. (Auth.mod.)

I-49757

Deminov, I.G., **Photochemical mechanism of the spring anomaly in the stratospheric ozone in Antarctica** [O fotokhimicheskom mekhanizme vesennei anomalii stratosfernogo ozona v Antarktike], Issledovanie atmosfernogo ozona (Ozon-90) (Atmospheric ozone study (Ozone-90)). Edited by N.A. Zaitseva and V.U. Khattatov, Moscow, Gidrometeoizdat, 1992, p.66-71, In Russian with English summary. 6 refs.

In order to explain a significant decrease in stratospheric ozone in the spring over Antarctica, a photochemical mechanism is suggested based upon the processes [formation of polar stratospheric clouds (PSCs), heterogeneous reactions at PSC particles, a ClO dimerization reaction, etc.] leading to drastic redistribution of odd chlorine and odd nitrogen species during polar night, and subsequent response of the ozonosphere to such a redistribution in odd chlorine and odd nitrogen with the sunrise in springtime. Based upon the suggested mechanism in the two-dimensional radiative-photochemical model, numerical simulations were carried out, simulating the principal features of the spring anomaly. (Auth. mod.)

I-49765

Sreedharan, C.R., Russel, D.G., Basarkar, S.S., **Surface ozone measurements from Dakshin Gangotri, Antarctica**, *Current science*, May 10, 1993, 64(9), p.632-634, 6 refs.

The main objective of the reported measurements was to find out the nature of the variations of surface ozone during the rapid depletion and fast recovery of total ozone in late winter and early spring over the Antarctic. The surface ozone values show a summer minimum of the order of 20 ppbv and a winter maximum of the order of 42 ppbv. The transition from the low summer value to the high winter value occurs during May-June. From Oct. to Nov. there is a sharp fall in the surface ozone values. This fall takes place at a time when the total ozone values are sharply rising from the lowest annual value. Other notable features of the surface ozone at Dakshin Gangotri during 1989 are the near absence of a diurnal variation even during the summer months, and the absence of significant changes during blizzards. The results agree fairly well with measurements reported from Showa. (Auth. mod.)

I-49766

Sreedharan, C.R., Gulhane, P.M., Kataria, S.S., **Ozone soundings over Antarctica**, *Current science*, May 10, 1993, 64(9), p.634-636, 8 refs.

Two typical balloon ozone soundings with the Indian ozonesonde taken from Dakshin Gangotri bring out clearly the intense ozone depletion at levels between 14 and 25 km during spring and the filling of the ozone hole in summer. At 20 km, the ozone partial pressure during spring fell to 12 micro-mb from 168 micro-mb in summer, with corresponding temperature changes from -80 to -36 C. (Auth.)

I-49767

Chubachi, S., **First detection of antarctic ozone hole**, *Current science*, May 10, 1993, 64(9), p.636-639, 10 refs.

An early program of ozone observations at Showa Station is described. During the JARE 23 in 1981, ozone measurements were made by moonlight instead of sunlight from Apr. through Aug. Lunar Dobson measurements were valid when the moon was more than half full and had an elevation of more than 20 deg. These requirements effectively reduced the total number of observations by one half. Later in 1981, on Sep. 4, the JARE team observed a new record low temperature at Showa: -45.7C. Accompanying the low temperature was a very low ozone Dobson value which is now believed to be the starting point of the antarctic ozone hole research.

I-49782

Loopmann, A., **Effect of climatic factors on the ice, temperature and oxygen regimes in the lakes of the Schirmacher Oasis during the summer season 1983/84**, Limnological studies in Queen Maud Land (East Antarctica). Edited by J. Martin, Tallinn,

Valgus, 1988, p.43-56, 13 refs.

DLC QH84.2.L56

Summarized in this paper are data of stationary meteorological and actinometrical observations at Novolazarevskaya Station and the results of simultaneous daily and episodic hydrological investigations of the lakes in the region. This informative material is used in the analysis and synthesis of the interaction of various climatic factors on the formation of ice and on temperature conditions and the oxygen regime during the high water season of 1983-1984. On the basis of data presented, the origin and development of antarctic lakes are discussed.

I-49783

Loopmann, A., Klovov, V., **Formation of water run-off from lake catchments of the Schirmacher Oasis in East Antarctica during the summer season 1983- 1984**, Limnological studies in Queen Maud Land (East Antarctica). Edited by J. Martin, Tallinn, Valgus, 1988, p.57-65, 2 refs.

DLC QH84.2.L56

This paper deals with observational data on the daily levels and water discharge values of the effluents of the Schirmacher Ponds from late Oct. 1983 to the middle of Mar. 1984. The mean air temperature values were as follows: -7 C in Nov.; 0.8 C in late Dec. and Jan.; and -3.7 C in Feb. Basic morphometric parameters and flow regimes of the lakes show that the water outflow, under an ice cover 60-220 cm thick, began at the end of Dec. Maximum water discharge values, ranging from 0.5 to 1.3 cu m/s, occurred in the first half of Jan., when parts of the lakes investigated were entirely free of ice. The formation of a new ice cover toward the end of Feb. caused the water runoff to cease. Tabulated lake level and discharge values of the effluents show that the rise in levels averaged 20-30 cm during the high water period.

I-49789

Toumi, R., Bekki, S., **Importance of the reactions between OH and ClO for stratospheric ozone**, *Geophysical research letters*, Nov. 19, 1993, 20(22), p.2447-2450, 17 refs.

Recent analysis of ozone trends in the upper stratosphere suggest that models overestimate the decrease of ozone in the upper stratosphere over the last decade (WMO, 1992). To clarify this problem the authors incorporate the reaction $\text{OH} + \text{ClO} \rightarrow \text{HCl} + \text{O}_2$ in a two-dimensional radiative-chemical-transport model and find that this reaction reduces the ClO/HCl ratio to agree better with observations. The calculated trend in the upper stratosphere is lower and agrees well with some observations. The effect of this reaction on the lower stratosphere is small. The reaction $\text{OH} + \text{ClO} \rightarrow \text{Cl} + \text{HO}_2$ is the main sink for OH in regions of elevated ClO and low ozone such as during the antarctic spring. (Auth. mod.)

I-49790

Pitts, M.C., Thomason, L.W., **Impact of the eruptions of Mount Pinatubo and Cerro Hudson on antarctic aerosol levels during the 1991 austral spring**, *Geophysical research letters*, Nov. 19, 1993, 20(22), p.2451-2454, 11 refs.

This paper uses measurements of aerosol extinction from the Stratospheric Aerosol and Gas Experiment and Stratospheric Aerosol Measurement satellite instruments to identify and track the movement of the Mt. Pinatubo and Cerro Hudson aerosol layers over the Antarctic from Aug. through Nov. 1991. The extent to which these individual layers penetrated the antarctic polar vortex are addressed. (Auth. mod.)

I-49791

Schoeberl, M.R., et al, **Evolution of ClO and NO along air parcel trajectories**, *Geophysical research letters*, Nov. 19, 1993, 20(22), p.2511-2514, 17 refs.

Back trajectory analysis of arctic and antarctic aircraft data reveals that ClO concentrations are associated with predicted polar stratospheric cloud (PSCs) encounters. The ClO concentrations within the arctic and antarctic polar vortices vary widely but appear to be inversely related to parcel solar exposure since the last PSC interaction. These results imply that production of NO_x from HNO₃ photolysis and reaction with OH is the mechanism for the loss of chlorine radicals through the reformation of chlorine nitrate. Although PSC processing is the primary mechanism for producing elevated ClO levels, back trajectories apparently unperturbed

by PSCs also show slightly elevated ClO levels in 1992 compared to Arctic 1989 and Antarctic 1987 measurements, presumably due to the presence of Pinatubo aerosol. (Auth. mod.)

I-49820

O'Connor, W.P., Bromwich, D.H., Carrasco, J.F., **Cyclonically forced barrier winds along the Transantarctic Mountains near Ross Island**, *Monthly weather review*, Jan. 1994, 122(1), p.137-150, 37 refs.

The effect of the Transantarctic Mountains on cyclonically forced boundary-layer winds in the vicinity of Ross I. is discussed. When cyclones are present over the western Ross Ice Shelf and Ross Sea, the low-level easterly airflow is toward the mountains. A barrier wind regime is set up as the flow is turned northward and becomes parallel to the mountain range. It is found that cyclonically forced barrier winds occurred around 5% and 8% of the time during 1984 and 1985, respectively. The case histories of two well-defined barrier wind events lasting for 24 h are discussed in detail, with regional analyses based on satellite photographs and automatic weather station data. One case is for a katabatic wind-forced mesoscale cyclone forming to the north of Ross I., and the other is for a synoptic-scale cyclone moving through the western Ross Ice Shelf-Ross Sea region. A numerical model for the vertically integrated boundary-layer flow that calculates two horizontal velocities and the boundary-layer depth is used to investigate the mountain barrier effect on low-level airflow. The domain is the region of the western Ross Ice Shelf-Ross Sea from 82 to 76S, between Byrd Glacier and Terra Nova Bay, and bounded to the west by the Transantarctic Mountains. The boundary-layer airflow is constrained to remain below the height of the mountains, so that the surface airflow is around the topographic features of Minna Bluff and Ross I. The two cases of cyclonic forcing are modeled, with the isobars intersecting the mountains obliquely. The model depicts the pressure increases and stagnation zones south of Minna Bluff and Ross I., and the surface airflow eastward past these features, which agree with observations. (Auth. mod.)

I-49821

Tolbert, M.A., Koehler, B.G., Middlebrook, A.M., **Spectroscopic studies of model polar stratospheric cloud films**, *SPIE—The International Society for Optical Engineering. Proceedings*, 1992, Vol. 1715, Optical methods in atmospheric chemistry. Edited by H.I. Schiff et al, p.48-58, 18 refs. For another version see 47-1172.

DLC QC879.6.O68

Fourier transform infrared (FTIR) spectroscopy has been used to study nitric-acid/ice films representative of type I polar stratospheric clouds (PSCs). These studies reveal that in addition to amorphous nitric acid/ice mixtures, there are three stable stoichiometric hydrates of nitric acid: nitric-acid monohydrate, dihydrate and trihydrate. FTIR spectroscopy is also used to study the interaction of HCl with model PSC films. For HCl pressures in the range 10^{-5} - 10^{-7} Torr, HCl is taken up by ice at 155 K to form a thin layer of HCl·6H₂O. At 193 K, the uptake of HCl by ice was consistent with less than monolayer coverage. (Auth. mod.)

I-49822

Miller, H.L., Jr., et al, **Scattered sky observation of stratospheric OCIO at McMurdo Station, Antarctica**, *SPIE—The International Society for Optical Engineering. Proceedings*, 1992, Vol. 1715, Optical methods in atmospheric chemistry. Edited by H.I. Schiff et al, p.250-257, 12 refs.

DLC QC879.6.O68

Ground-based measurements of scattered light were collected in the antarctic fall, winter, and spring at McMurdo Station during 1991. These measurements yielded values of the slant column amounts of the dioxides of chlorine and nitrogen found in the stratosphere. Two different viewing schemes were used to collect this data: a zenith viewing mode to collect light scattered from directly overhead, and a new off-axis viewing mode to collect light scattered along a path at 80 deg zenith angle toward the sun. This new viewing geometry allowed measurements to be made much further into twilight and polar winter than was previously possible with only the zenith viewing mode. Results of this analysis showed that OCIO levels were very high in late July and early Aug., declining through Sep., and dropping below detection threshold in early Oct. (Auth. mod.)

I-49826

Préndez, M., Vera, R., Ortíz, J., **Yelcho sub-base as reference site for tropospheric aerosols of Chile** [Sub-base antártica chilena Yelcho. Sitio de referencia para aerosoles troposféricos de Chile continental], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1993, No.43, p.41-63, In Spanish with English summary. Refs. p.61-63.

The mass-size distribution, shape and elemental chemical composition of tropospheric aerosols at the Chilean sub-base Yelcho were studied during the summer seasons of 1988 and 1989 at two different altitudes. Filtration and impaction were used to collect the samples. Atomic absorption spectrophotometry, electron microscope and electronic microsonde were used for the chemical and shape analysis. Statistical methods oriented to the receptor were used to determine origin and sources of the elements. Comparing this site with others of reduced pollution, it was concluded that the Yelcho sub-base is a very good site for measuring the background-level aerosols useful in studies in continental Chile. (Auth. mod.)

I-49836

Baeza, A., et al, **Natural and artificial radioactivity levels in Livingston Island (Antarctic regions)**, *Environmental contamination and toxicology. Bulletin*, Jan. 1994, 52(1), p.117-124, 22 refs.

Radioactive contamination of the sea and land is due to fallout from atmospheric atomic explosions since 1945, and to emissions produced by nuclear and radioactive facilities. Given its geographic position—distant from main sources of radioactive contamination—Antarctica should have the lowest levels on earth of artificial radionuclides in the different receptor media characteristic of the trophic chain of Antarctica: melt-water, seawater, mosses, algae, and lichens. With the aim of contributing basic information on the radiation levels present in the antarctic ecosystems, the authors have identified and measured for the first time the radioactive levels of natural emitters (of cosmic and terrestrial origin) and man-made emitters in the vicinity of the Juan Carlos I Station. (Auth. mod.)

I-49839

Waters, J.W., **Chlorine threat to stratospheric ozone**, *Engineering and science*, 1993, 56(4), p.2-13.

From JPL's satellite-borne microwave instrument, launched in 1991, has come dramatic additional evidence implicating chlorine chemistry in Antarctica's ozone hole—and the suggestion that similar processes of ozone destruction are occurring in the north.

I-49849

Law, K.S., Pyle, J.A., **Modeling trace gas budgets in the troposphere. 1. Ozone and odd nitrogen**, *Journal of geophysical research*, Oct. 20, 1993, 98(D10), p.18,377-18,400, Refs. p.18,397-18,400.

A two-dimensional photochemical model of the atmosphere was used to calculate dynamical and chemical budgets in the troposphere. Model distributions of O₃ and NO_y species are compared with observations. The seasonal variations of these species can be explained in terms of the variation of the different components of their budgets. Regional variations are apparent. In the Northern Hemisphere, where results represent a "mean" polluted troposphere, the O₃ budget is essentially a balance between net photochemical production and loss via dry deposition in the summer. The flux from the stratosphere plays an important role in the winter and early spring. In the Southern Hemisphere the flux of O₃ from the stratosphere again makes a significant contribution in the winter and spring. The chemical production is much reduced compared with the Northern Hemisphere. The NO_y budget is a balance between NO_x emissions and loss via wet and dry deposition of HNO₃. Charts and graphs accompanying the article include data extending to 90N and 90S.

I-49850

Law, K.S., Pyle, J.A., **Modeling trace gas budgets in the troposphere. 2. CH₄ and CO**, *Journal of geophysical research*, Oct. 20, 1993, 98(D10), p.18,401-18,412, 36 refs.

A two-dimensional photochemical model of the atmosphere was used to calculate regional and global budgets for CH₄ and CO in the troposphere. The modeled distributions of these trace gases are compared to relevant observations and show good agreement when the zonal average nature of the model results is taken into account. The chemical and dynamical components of the budgets are investigated and used to explain the seasonal distribution of CH₄ and CO in the model. The seasonal variation is governed mainly by the seasonal variation in emissions and transport between the hemispheres. Destruction by OH is also important at certain times of the year. The charts and graphs accompanying this article include data to 90 deg S and N. (Auth. mod.)

I-49851

Herber, A., Thomason, L.W., Radionov, V.F., Leiterer, U., **Comparison of trends in the tropospheric and stratospheric aerosol optical depths in the Antarctic**, *Journal of geophysical research*, Oct. 20, 1993, 98(D10), p.18,441-18,447, 32 refs.

Temporal variations in the aerosol optical depth of the antarctic troposphere and stratosphere are considered on the basis of long-term sun photometer and actinometer measurements which have been made at Mirnyy and Georg Forster stations since 1956 and 1988, respectively. This data is supplemented by measurements of the stratospheric aerosol optical depth by the satellite-borne stratospheric aerosol measurement II instrument. These observations indicate that under undisturbed conditions, the stratospheric aerosol optical depth represents approximately 25% of the total atmospheric aerosol optical depth. The aerosol optical depth in the Antarctic is most notably affected by volcanic eruptions, such as El Chichon in 1982 and Mount Pinatubo and Cerro Hudson in 1991, and by the occurrence of polar stratospheric clouds during antarctic winter and spring. Apart from these episodic events, no long-term trend in the aerosol optical depth can be discerned from the nearly 40-year record. (Auth.)

I-49852

Hofmann, D.J., Oltmans, S.J., **Anomalous antarctic ozone during 1992: evidence for Pinatubo volcanic aerosol effects**, *Journal of geophysical research*, Oct. 20, 1993, 98(D10), p.18,555-18,561, 13 refs.

Unusual stratospheric ozone levels were observed in the antarctic stratosphere in 1992. The rate of ozone decrease during formation of the springtime ozone hole and the severity of ozone loss in the lower stratosphere were greater in 1992 than in previous years. Total ozone reached an all-time low of about 105 Dobson units on Oct. 11 at South Pole Station. On this day, the balloon-borne instrument encountered an apparent ozone void between altitudes of 14 and 18 km. Ozone profiles showed evidence of unusual ozone depletion in autumn, before polar stratospheric cloud existence temperatures were reached. Satellite measurements indicated that the 1992 ozone hole was about 25% larger in geographical extent than in previous years. The possible effects of the eruption of the Pinatubo volcano in the Philippine Is. in 1991 are investigated, and it is concluded that the sulfuric acid droplets which formed in the stratosphere following the eruption and were trapped in the south polar vortex are the most likely source of the anomalous antarctic ozone depletion in 1992. (Auth.)

I-49853

Del Guasta, M., et al, **One year of cloud lidar data from Dumont d'Urville (Antarctica). 1. General overview of geometrical and optical properties**, *Journal of geophysical research*, Oct. 20, 1993, 98(D10), p.18,575-18,587, 46 refs.

Tropospheric clouds play a major role in climatic regulation, but so far only a few long-term ground-based observations devoted to the study of the cloud optical and radiative properties have been carried out. In this work the statistics of 1 year of coastal antarctic cloud lidar measurements (532 nm) are shown. Cloud macrophysical and optical parameters were retrieved from lidar returns; radiosonde data allowed the authors to build statistics of such quantities in terms of cloud temperature. Information about the physical phase of water and ice crystal habit was obtained from the depolarization and extinction/backscattering ratio; a change in crystal habit (and/or size) around -30 C is evidenced by the depolarization versus temperature behavior. The extinction/backscattering ratio shows a negative trend with temperature, reflecting microphysical changes. Visible extinction shows wide data dispersion, but with a marked negative trend

with temperature. The relative derivatives of extinction and optical depth with temperature were computed; these quantities are nearly constant with temperature. (Auth.)

I-49877

Martyn, D., **Climates of the world**, Developments in Atmospheric Science, 18, Amsterdam, Elsevier, 1992, 435p. + fold. map, Translated from Klimaty kuli ziemskiej. Refs. p.389-400.

The first part of this work discusses the principal processes and factors shaping and differentiating climatic conditions, the distribution of climatic elements and the regionalization of climates. The second and main part examines the climates of the continents and oceans, including Iceland, Norway, Sweden, Finland, the countries of the former USSR, Canada and Alaska, the Arctic, and Antarctica. The continents are treated in considerable detail, the oceans rather more generally. Each section on a particular continent begins with a climatic review of the whole continent, followed by a detailed discussion of the climatic conditions of large countries or groups of smaller ones in that continent. These subsections discuss such factors as the length of daylight, number of sunshine hours, solar radiation, air pressure systems and winds, temperatures, humidity, cloudiness and precipitation experienced by these regions, together with any climatic factors peculiar to them, e.g. cyclones. (Auth. mod.)

I-49885

Stening, R.J., **Investigation of solar activity effects in Australian radiosonde data**, *Journal of atmospheric and terrestrial physics*, Apr. 1994, 56(5), p.545-553, 14 refs.

Radiosonde data spanning 25 yr, obtained at different latitudes including Macquarie I., have been subjected to superposed epoch analysis, using as key days those days with major solar flares. A clear decrease in atmospheric temperature is observed three days after the key day at Alice Springs. Monte Carlo tests and the Sign Test confirm the significance of this result. Similar effects are observed at other locations but they are not as clear. The effect is also clearer if winter months are excluded. The worldwide tendency for these relationships to be clearest in Jan.-Feb. lends support to suggested mechanisms involving the global electric field. (Auth.)

I-49886

Lesicar, D., Hocking, W.K., Vincent, R.A., **Comparative studies of scatterers observed by MF radars in the Southern Hemisphere mesosphere**, *Journal of atmospheric and terrestrial physics*, Apr. 1994, 56(5), p.581-591, Refs. p.589-591.

Using data from three radar sites at low, mid and high latitudes (Mawson Station), the authors studied the aspect sensitivity of mesospheric scatterers probed by MF radars operating at or near a frequency of 2 MHz. The aspect sensitivity (Os) is calculated by the spatial correlation technique. Calculations of Os are further extended to estimate the length-to-depth ratio of the scatterers which indicate that the scatterers are quasi-specular. It was found that high- and mid-latitude sites exhibit clear seasonal behavior, with maxima occurring in the local summer, while the low latitude site shows no significant seasonal behavior. (Auth.)

I-49887

Vincent, R.A., **Gravity-wave motions in the mesosphere and lower thermosphere observed at Mawson, Antarctica**, *Journal of atmospheric and terrestrial physics*, Apr. 1994, 56(5), p.593-602, Refs. p.601-602.

The results of MF radar observations of mean winds and waves, in the height range 78-108 km at Mawson Station, are presented. The measurements were made in the period from 1984 to 1990. Climatologies of the prevailing zonal and meridional circulations made with a 12-day time resolution show that the mean circulation remained relatively stable over the 6 yr of observation. Climatologies of gravity-wave motions in the 1-24 h period range were also generated. These reveal that the r.m.s. amplitudes of horizontal wave motions near the mesopause (about 90 km) are about 30 m/s, and that there is some anisotropy in the motions, especially at heights below 90 km. Meridional amplitudes are larger than zonal amplitudes, which suggests a preference for wave propagation in the north-south direction. Comparisons with MST radar wind observations made

near the summer solstice at Poker Flat, AK and at Andøya, Norway show similarities with the Mawson observations, but the wave amplitudes and mean motions are larger in magnitude at the northern sites. (Auth. mod.)

I-49894

Peter, T., **Stratospheric ozone layer—an overview**, *Environmental pollution*, 1994 (Pub. 1993), 83(1-2), p.69-79, Refs. p.78-79.

This paper summarizes the knowledge on the properties of the stratospheric ozone layer. Dynamic, chemical, and microphysical aspects are reviewed with emphasis on chemistry. The questions addressed are as follows: do we have a quantitative understanding of the antarctic ozone hole? What lies behind the trend of slowly decreasing ozone columns over northern mid-latitudes? To what degree was chemistry responsible for the extremely low ozone levels over northern Europe in Jan. 1992? (Auth. mod.)

I-49911

Stössel, A., Claussen, M., **On the momentum forcing of a large-scale sea-ice model**, *Climate dynamics*, Nov. 1993, 9(2), p.71-80, 37 refs.

A large-scale sea-ice-oceanic mixed-layer model for the southern ocean, centralized on the antarctic continent, is forced with daily atmospheric fields from operational numerical weather prediction analyses. The strength of the atmospheric forcing is modified considering atmospheric surface-layer physics, which is itself directly dependent on the instantaneous sea-ice condition provided by the sea-ice model. The present study includes a large-scale momentum flux, which is characterized by a large-scale stability function and a large-scale roughness length. The large-scale roughness length depends on the local skin drags and on the form drag, where the latter is given as a function of the ice-plus-snow freeboard and the ice concentration, both provided by the sea-ice model. The thermodynamic part of the calculation is given by the local fluxes, which depend on the local stability of the atmospheric surface layer. This description of the large-scale dynamic forcing generally leads to an increase of the momentum transfer via an increase of the roughness length, and a decrease of the stability in the atmospheric surface layer. Finally, this yields improved model results, especially in terms of a more dynamic pattern of the ice thickness distribution. (Auth. mod.)

I-49926

Peters, D., Egger, J., **Antarctic slope winds without surface cooling: experiments with a general circulation model**, *Contributions to atmospheric physics*, Aug. 1993, 66(3), p.253-258, With German summary. 7 refs.

This paper tests the hypothesis that mid-latitude synoptic-scale systems protruding southward into the antarctic domain are modified by antarctic topography such that they transport westerly angular momentum out of Antarctica. These transports must be balanced by momentum generation through southeasterly near-surface winds in a climatic mean state. In other words, a "realistic" downslope wind regime would be observed in Antarctica even if cooling at the surface were absent. A general circulation model with Newtonian heating but without surface heat fluxes is used to verify this prediction. The model results provide ample evidence for this topographic wave modification mechanism: northward eddy transports of momentum and the related strong southeasterly surface winds occur in runs with orography but are absent in an experiment without mountains. Additional westerly angular momentum is generated by the mountain torque in runs with realistic topography. (Auth. mod.)

I-49927

Lubin, D., **Infrared radiative properties of the maritime antarctic atmosphere**, *Journal of climate*, Jan. 1994, 7(1), p.121-140, 59 refs.

The longwave radiation environment of the Antarctic Peninsula and southern ocean has been investigated using radiometric Fourier Transform Infrared (FTIR) measurements of atmospheric emission in conjunction with detailed radiative transfer theory. The California Space Institute FTIR Spectroradiometer was deployed at Palmer Station, where it made zenith sky emission measurements several times daily between Aug. 25 and Nov. 17, 1991. Emission spectra covered the entire middle infrared (5-20 micron) with one inverse centimeter spectral resolution. For FTIR data

obtained under cloudy skies, a least-squares algorithm is used to match the emission spectra with discrete-ordinate radiative transfer calculations that are based on marine cloud microphysics. The algorithm provides a determination of cloud emissivity, and useful estimates of cloud optical depth and equivalent radius of the droplet size distribution. Temperatures in the lower troposphere between 259 K and 273 K diminish the radiative importance of water vapor and enhance the importance of clouds and CO₂ relative to mid-latitudes. Most low stratiform clouds appear to have moderate mid-IR optical depth (5-10), but relatively large equivalent radius (9-11 micron). However, clouds with base height between 1 and 2 km have noticeably smaller emissivities and optical depths. The emissivity of maritime antarctic clouds is determined to be smaller for a given liquid water path than the parameterization used in the NCAR Community Climate Model, and an appropriate mass absorption coefficient for antarctic clouds is 0.065 m²/g for the mid-IR window. (Auth. mod.)

I-49968

Walden, V.P., Heuberger, R., Warren, S.G., Murcray, F.J., **Atmospheric longwave radiation spectrum on the antarctic plateau**, International Radiation Symposium, Tallinn, Estonia, Aug. 3-8, 1992. Proceedings. Current problems in atmospheric radiation. Edited by S. Keavallik et al, Hampton, VA, A. DEEPAK Publishing, 1993, p.245-247, 9 refs. For another version see 21I-47942.

DLC QC3.I57

Downward infrared spectral radiances were measured with a Fourier transform interferometer at South Pole Station for an entire year. Coincident measurements of atmospheric profiles of temperature, ozone, and water vapor were obtained from various sondes. Sky conditions were monitored by visual observations, a laser ceilometer, and photographs during the sunlit season. Snow crystals in the atmosphere were located and their sizes measured under a microscope. These data will be used to identify the controls of the longwave radiation budget of the antarctic plateau. Parameterizations of the downward longwave in terms of the extreme surface temperature inversion, near-surface ice crystals, and clouds will ultimately be developed. A well-documented data set will be made available to the climate modeling community as test cases from one of the most extreme atmospheric conditions on earth where the total downward irradiance is less than 65 W/m² periodically in the winter. (Auth.)

I-49977

Ejiri, M., et al, **Polar patrol balloon project in Japan**, *Advances in space research*, Feb. 1994, 14(2), p.(2)201-(2)209, 11 refs.

Since 1984 the National Institute of Polar Research and the Institute of Space and Astronautical Science have studied the feasibility of a long-term circumpolar balloon experiment, called the Polar Patrol Balloon (PPB) project. This project aims at establishing a PPB system to bring scientific payloads in the stratosphere over the antarctic region. Three test flights in 1987 and 1990 at Showa Station proved that the PPB would have a good chance of returning to the launching area, provided it flew during the antarctic summer season when there is no sunset. PPB experiments were consequently made in 1990 to 1991. PPB No.1, which was launched on Dec. 25, 1990, reached a height of 30 km and drifted westwards. At 22:30 (UT) on Jan. 8, 1991, the PPB passed 400 km north of Showa Station; this means that the PPB accomplished a complete circumpolar flight over Antarctica. The second flight (No.2) was successfully launched on Jan. 5, 1991. Flight 3 was carried out Sep. 23-28, 1991, when the antarctic ozone hole was well developed. (Auth.)

I-49989

Mahlman, J.D., Pinto, J.P., Umscheid, L.J., **Transport, radiative, and dynamical effects of the antarctic ozone hole: a GFDL "SKYHI" model experiment**, *Journal of the atmospheric sciences*, 1994, 51(4), p.489-508, 27 refs.

The GFDL "SKYHI" general circulation model has been used to simulate the effect of the antarctic ozone hole phenomenon on the radiative and dynamical environment of the lower stratosphere. Both the polar ozone destruction and photochemical restoration chemistries are calculated by parameterized simplifications of the still somewhat uncertain chemical processes. The modeled total column ozone depletions are near 25% in spring over Antarctica, with 1% depletion reaching equatorial latitudes by the end of the 4 1/2-year model experiment. In the lower stratosphere, ozone reductions of 5% reach to the equator. Large coolings of

about 8 K are simulated in the lower stratosphere over Antarctica in late spring, while a general cooling of about 1-1.5 K is present throughout the Southern Hemisphere lower stratosphere. The model atmosphere experiences a long-term positive temperature-chemical feedback because significant ozone reductions carry over into the next winter. The overall temperature response to the reduced ozone is essentially radiative in character. However, substantial dynamical changes are induced by the ozone hole effect. The antarctic middle stratosphere in late spring warms by about 6 K over Antarctica, and the lower mid-latitude stratosphere warms by approximately 1 K. These warming spots are produced mainly by an increased residual circulation intensity. (Auth. mod.)

I-50002

Connolley, W.M., Cattle, H., **Antarctic climate of the UKMO Unified Model**, *Antarctic science*, Mar. 1994, 6(1), p.115-122, Refs. p.121-122.

Some aspects of the performance of the United Kingdom Meteorological Office's new climate model over Antarctica are examined. Pressure and temperature fields are presented as a basic check on the model climate. The gradient of pressure between mid-latitudes and high southern latitudes is too great, resulting in an antarctic trough that is too deep by 4-6 hPa. Temperature is well modelled, though the interior is slightly too cold in winter. Precipitation is interesting because of its relevance to mass balance and therefore changes in sea level. The simulation of the pattern of accumulation is good despite somewhat high values at places in the coastal areas, with an areally-averaged value of 182 mm/y. The authors also look at the phenomena of the coreless winter and the katabatic winds which are a consequence of the intense radiative cooling. These two effects may provide a useful diagnostic of the model performance. (Auth.)

I-50015

NATO Advanced Research Workshop on the Tropospheric Chemistry of Ozone in the Polar Regions, Wolfville, Nova Scotia, Canada, Aug. 23-28, 1992, Niki, H., ed, Becker, K.H., ed, **Proceedings**, NATO Advanced Science Institutes, Series I. Global environmental change. Vol.7, Berlin, Springer-Verlag, 1993, 425p., Refs. passim. For selected papers see 48-3046 through 48-3062 or F-50019, F-50020, I-50016 through I-50018 and I-50021.

DLC QC879.73.P6T76

This volume comprises the proceedings of the NATO/Advanced Research Workshop meeting held in Wolfville, Nova Scotia, Canada, from Aug. 22-28, 1992, including 34 participants from 7 countries. The results presented here concentrate on the chemical composition of the polar troposphere in both hemispheres, and attempt to illuminate the susceptibility of the atmospheric boundary layer to ozone depletion through the influence of various chemical agents, notably bromine and nitrous oxide species, which are associated with assorted sources of air pollution. Emphasis was also placed on comprehension of the contrasting behavior of tropospheric ozone between arctic and antarctic regions.

I-50016

Barrie, L.A., **Features of polar regions relevant to tropospheric ozone chemistry**, NATO Advanced Research Workshop on the Tropospheric Chemistry of Ozone in the Polar Regions, Wolfville, Nova Scotia, Canada, Aug. 22-28, 1992. Proceedings. Edited by H. Niki et al and NATO Advanced Science Institutes, Series I. Global environmental change. Vol.7, Berlin, Springer-Verlag, 1993, p.3-24, 27 refs.

DLC QC879.73.P6T76

It is becoming increasingly apparent that the polar regions play an important role in the atmospheric cycle of ozone. What is perhaps less well recognized is that this is true not only in the stratosphere (above 8 to 10 km) but also in the troposphere (0 to 8 km). The aim of this paper is to describe those characteristics of geography, climate and chemical environment in the Arctic and Antarctic that assist in the understanding of polar tropospheric ozone. (Auth. mod.)

I-50017

Oltmans, S.J., **Climatology of arctic and antarctic tropospheric ozone**, NATO Advanced Research Workshop on the Tropospheric Chemistry of Ozone in the Polar Regions, Wolfville, Nova Scotia,

Canada, Aug. 22-28, 1992. Proceedings. Edited by H. Niki et al and NATO Advanced Science Institutes, Series I. Global environmental change. Vol.7, Berlin, Springer-Verlag, 1993, p.25-40, 17 refs.

DLC QC879.73.P6T76

In the Northern Hemisphere, there are several high latitude locations where regular ozone vertical profile measurements have been made. At two sites in Canada—Churchill, near the southern edge of the polar region, and Resolute, at a higher polar latitude—longer term records are available that provide an opportunity to assess possible ozone trends in the arctic troposphere. In addition, shorter records at Barrow, AK and Alert, NWT give a picture of the seasonal variation over a wide range of polar latitudes. At Barrow the 20-year surface ozone record is examined for seasonal and long-term variability. This high resolution (hourly) time series is compared to the surface observations from the ozonesonde stations where observations are made about once a week. In the Antarctic, ozonesonde data from South Pole and Showa give a representative picture of conditions from the coast to the interior of the continent. At South Pole, the 17-year surface ozone record is examined for long-term changes. (Auth. mod.)

I-50018

Sturges, W.T., **Halocarbons in the arctic and antarctic atmosphere**, NATO Advanced Research Workshop on the Tropospheric Chemistry of Ozone in the Polar Regions, Wolfville, Nova Scotia, Canada, Aug. 22-28, 1992. Proceedings. Edited by H. Niki et al and NATO Advanced Science Institutes, Series I. Global environmental change. Vol.7, Berlin, Springer-Verlag, 1993, p.117-130, 35 refs.

DLC QC879.73.P6T76

A wide range of halocarbon gases (those containing one or more of the halogens chlorine, fluorine, bromine and iodine) have been identified in the polar atmosphere. Their origins are various, from both anthropogenic and natural sources. Although much is known about the transformations of halocarbons in the stratosphere, and their apparent involvement in antarctic stratospheric ozone depletion in particular, much less is known about their potential impact on tropospheric ozone chemistry. Nevertheless, the arctic spring bromine "pulse" and negative correlation between particulate bromine and ozone is compelling evidence for halogen-ozone reactions in the polar troposphere. In the Antarctic, the progressive decline in free tropospheric ozone in austral summer has been attributed to greater UV penetration through the ozone-depleted stratosphere, a possible example of an indirect effect of halocarbons on tropospheric ozone. (Auth. mod.)

I-50021

Molina, M.J., **Chemical interactions of tropospheric halogens on snow/ice**, NATO Advanced Research Workshop on the Tropospheric Chemistry of Ozone in the Polar Regions, Wolfville, Nova Scotia, Canada, Aug. 22-28, 1992. Proceedings. Edited by H. Niki et al and NATO Advanced Science Institutes, Series I. Global environmental change. Vol.7, Berlin, Springer-Verlag, 1993, p.273-279, 13 refs.

DLC QC879.73.P6T76

In experiments intended to explain chemical reactions in the polar troposphere, this work indicates that at a given temperature the precipitating ice surface melts if it is exposed to HCl partial pressures above those characteristic of the ice-liquid equilibrium system, i.e., above the vapor pressure of an aqueous hydrochloric acid solution in equilibrium with ice at that temperature. At smaller HCl partial pressures HCl vapor is also rapidly taken up by the ice surface, but only in monolayer amounts. Laboratory results are presented which confirm the relation between heterogeneous nucleation and ozone depletion. (Auth. mod.)

I-50022

Argentini, S., Mastrantonio, G., **Barrier winds recorded during two summer antarctic campaigns and their interaction with the katabatic flows as observed by a tri-axial Doppler sodar**, *International journal of remote sensing*, Jan. 20, 1994, 15(2), p.455-466, 19 refs.

An observational study has been done during summertime in the Terra Nova Bay area using a monostatic Doppler sodar and Automatic Weather Stations (AWS) data. Several barrier wind episodes were recorded and the stability of the atmosphere evidenced on the facsimile record of the echo sodar. In most of the cases the barrier wind profiles showed a jet-like shape that became well defined after about 10 hours. Data from the AWSs located around the Ross Ice Shelf confirm the sodar observations. Some examples of superimposition of barrier and katabatic winds are also shown. (Auth.)

I-50028

Tao, X., Tuck, A.F., **On the distribution of cold air near the vortex edge in the lower stratosphere**, *Journal of geophysical research*, Feb. 20, 1994, 99(D2), p.3431-3450, 29 refs.

The horizontal distributions of air in various temperature ranges between -70 and -80 C have been examined during the arctic winter of 1988/1989 and the antarctic winter of 1987, using T106 European Centre for Medium-range Weather Forecasts (ECMWF) analyses of standard meteorological variables and potential vorticity. ER-2 airborne data were used to define, using water vapor and nitrous oxide observations, a potential vorticity contour corresponding to a chemically defined vortex edge. Air in the range -70 to -77 C was confined within the dynamically defined arctic vortex, with only small fractions appearing outside the chemically defined vortex. In the Antarctic, up to 14% of this air was outside the chemically defined vortex but very little was outside the dynamically defined vortex. After late Jan. (Arctic) and late Aug. (Antarctic), respectively, the chemically defined vortices shrank, being 27% and 20% smaller in Feb. and Sep. The dynamically defined vortices remained essentially constant in area. There were no occurrences of nominal type II polar stratospheric clouds (PSCs) outside either vortex, however defined. One implication of these results is that heterogeneous conversion of ClONO₂ and HCl to reactive forms of chlorine is confined almost entirely to the arctic vortex, while some such conversion may occur at the edge of the antarctic vortex. All three processes are intimately associated with the polar night jet stream. (Auth. mod.)

I-50029

Herman, J.R., Larko, D.E., **Low ozone amounts during 1992-1993 from Nimbus 7 and Meteor 3 total ozone mapping spectrometers**, *Journal of geophysical research*, Feb. 20, 1994, 99(D2), p.3483-3496, 38 refs.

The global distribution of ozone during the Oct. 31, 1978 to May 6, 1993 observational lifetime of the Nimbus 7 total ozone mapping spectrometer (TOMS) is described, with emphasis on the low ozone amounts observed during 1992 and 1993. Time series for zonally averaged ozone amounts show that there has not been a significant shift in the seasonal patterns of ozone maxima and minima caused by the Mount Pinatubo eruption or by the onset of very low ozone values during 1992 and 1993. There has been a relatively slow, nearly linear decrease in the amount of ozone over the entire globe from 1979 to the end of 1991, with rates ranging from no change at the equator to a 4-6% decrease per decade at mid-latitudes and a 10-12% decrease per decade at higher latitudes. At high northern latitudes, the 1993 decreased ozone amounts were about 12.5% below the envelope of historical values; at mid-latitudes they were about 7% lower; and at low latitudes they were about 4% lower. Area-weighted averages in the Northern and Southern Hemispheres show that most of the 1992-1993 ozone losses have occurred in the Northern Hemisphere. The 1993 global average (70S to 70N) ozone amount is 3% below the 1979 to 1991 minimum, 5% below the historical envelope in the Northern Hemisphere, and near the lower boundary of the historical envelope in the Southern Hemisphere. In the 70-60S latitude band, the ozone losses between 1979 and 1993 have reduced the annual minimum amount to values below those seen in the equatorial regions. (Auth. mod.)

I-50030

Elliott, S., et al, **Influence of the heterogeneous reaction HCl + HOCl on an ozone hole model with hydrocarbon additions**, *Journal of geophysical research*, Feb. 20, 1994, 99(D2), p.3497-3508, 95 refs.

Injection of ethane or propane has been suggested as a means for reducing ozone loss within the antarctic vortex, since alkanes can convert active chlorine radicals into hydrochloric acid. In kinetic models of vortex chemistry including only the hydrolysis and HCl reactions of ClONO₂ and

N_2O_5 , parts per billion by volume levels of the light alkanes counteract ozone depletion by sequestering chlorine atoms. Introduction of the surface reaction of HCl with HOCl causes ethane to deepen baseline ozone holes and generally works to impede any mitigation by hydrocarbons. The increased depletion occurs because $\text{HCl} + \text{HOCl}$ can be driven by HOx radicals released during organic oxidation. Following initial hydrogen abstraction by chlorine, alkane breakdown leads to a net hydrochloric acid activation as the remaining hydrogen atoms enter the photochemical system. Ignoring the organic peroxy radical plus ClO reactions entirely restores remediation capabilities by allowing HOx removal independent of HCl . Remediation also returns if early evaporation of polar stratospheric clouds leaves hydrogen atoms trapped in aldehyde intermediates, but real ozone losses are small in such cases. (Auth. mod.)

I-50031

Solomon, S., et al, **Visible and near-ultraviolet spectroscopy at McMurdo Station, Antarctica. 10. Reductions of stratospheric NO_2 due to Pinatubo aerosols**, *Journal of geophysical research*, Feb. 20, 1994, 99(D2), p.3509-3516, 27 refs.

Visible absorption spectroscopy was employed for stratospheric measurements at McMurdo Station during the summer and fall seasons 1990, 1991, 1992, and 1993. Observed column amounts of NO_2 were as much as 50% smaller in 1992 and 1993 than in 1990 and 1991. The measured decreases in NO_2 are believed to be due to the hydrolysis of N_2O_5 on the enhanced volcanic aerosols injected by the massive eruption of Mount Pinatubo in mid-1991. Such decreases in NO_2 are broadly consistent with observations at other latitudes and with model calculations. However, substantially reduced NO_2 was also observed during the polar day period in summer under conditions of continuous local solar illumination. The formation of the key N_2O_5 intermediate and reduction of NO_2 at this time of year probably occurs via two mechanisms: (1) excursions of air parcels to lower latitudes where nighttime chemistry can produce N_2O_5 , and (2) conversion of a small fraction of the NO_3 formed during the day to N_2O_5 . Model calculations show that the latter mechanism can be important in spite of the fast daytime photolysis of NO_3 . (Auth. mod.)

I-50032

Fried, A., Henry, B.E., Calvert, J.G., Mozurkewich, M., **Reaction probability of N_2O_5 with sulfuric acid aerosols at stratospheric temperatures and compositions**, *Journal of geophysical research*, Feb. 20, 1994, 99(D2), p.3517-3532, 53 refs.

In experiments which simulate chemical reactions in the antarctic stratosphere, the authors have measured the rate of reaction of N_2O_5 with H_2O on monodisperse submicron H_2SO_4 particles in a low-temperature flow reactor. Measurements were carried out at temperatures between 225 K and 293 K on aerosol particles with sizes and compositions comparable to those found in the stratosphere. At 273 K, the reaction probability was found to be 0.103 ± 0.006 , independent of H_2SO_4 composition from 64 to 81 wt %. At 230 K, the reaction probability increased from 0.077 for compositions near 60% H_2SO_4 to 0.146 for compositions near 70% H_2SO_4 . Intermediate conditions gave intermediate results except for low reaction probabilities of about 0.045 at 260 K on aerosols with about 78% H_2SO_4 . The reaction probability did not depend on particle size. These results imply that the reaction occurs essentially at the surface of the particle. A simple model for this type of reaction that reproduces the general trends observed is presented. The presence of formaldehyde did not affect the reaction rate. (Auth. mod.)

I-50033

Hanson, D.R., Ravishankara, A.R., Solomon, S., **Heterogeneous reactions in sulfuric acid aerosols: a framework for model calculations**, *Journal of geophysical research*, Feb. 20, 1994, 99(D2), p.3615-3629, 39 refs.

A framework for applying rates of heterogeneous chemical reactions measured in the laboratory to small sulfuric acid aerosols found in the stratosphere is presented. The procedure for calculating the applicable reactive uptake coefficients using laboratory-measured parameters is developed, the necessary laboratory-measured quantities are discussed, and a set of equations for use in models are presented. This approach is demonstrated to be essential for obtaining uptake coefficients for the $\text{HOCl} + \text{HCl}$ and $\text{ClONO}_2 + \text{HCl}$ reactions applicable to the stratosphere. In these cases the laboratory-measured uptake coefficients have to be substantially corrected for the small size of the atmospheric aerosol droplets.

The measured uptake coefficients for $\text{N}_2\text{O}_5 + \text{H}_2\text{O}$ and $\text{ClONO}_2 + \text{H}_2\text{O}$ as well as those for other heterogeneous reactions are discussed in the context of this model. Finally, the derived uptake coefficients were incorporated in a two-dimensional dynamical and photochemical model; thus for the first time the HCl reactions in sulfuric acid have been included. Substantial direct chlorine activation and consequent ozone destruction is shown to occur due to heterogeneous reactions involving HCl for volcanically perturbed aerosol conditions at high latitudes. Smaller but significant chlorine activation also is predicted for background aerosol loadings at extreme high latitudes, suggesting chlorine activation can occur on background sulfuric acid aerosol in these regions. (Auth. mod.)

I-50036

Wang, H.J., Zeng, Q.C., **Numerical simulation of the ice age climate**, *Acta meteorologica sinica*, 1993, 7(4), p.423-430, 19 refs.

Using the IAP two-level general circulation model, the ice age July climate was simulated through the surface conditions of 18,000 years b.p., assembled by the CLIMAP Project. Compared to contemporary July simulation results, the ice age atmosphere is found to have a substantially lower temperature, precipitation and cloudiness, and higher sea-level pressure, especially in the high latitude land region of the Northern Hemisphere and Antarctica. When the CO_2 content is set at current values the climatic response is small. There are some common characteristics between CO_2 -induced climatic changes and the ice age surface conditions-induced climatic changes, which may reveal mechanisms involved in climatic responses to external forcings. (Auth. mod.)

I-50049

Klinck, J.M., Smith, D.A., **Effect of wind changes during the last glacial maximum on the circulation in the southern ocean**, *Paleoceanography*, Aug. 1993, 8(4), p.427-433, 21 refs.

Present-day surface wind stress climatology is manipulated to simulate wind conditions during the last glacial maximum. These estimated wind fields force a one-layer, wind-driven numerical model of the southern ocean to determine if a change in the strength of the surface wind stress can shift the location of the Antarctic Polar Front, which is part of the Antarctic Circumpolar Current. A change in the forcing by a factor of 0.5-2.0 results in a change in the speed of the flow by an identical factor, with no change in position. However, if the present-day wind climatology is shifted meridionally, there is a change in both strength of the circulation and spatial pattern. A shift in the wind stress of more than 5 deg of latitude is required to produce a shift in the location of the polar front. (Auth.)

I-50050

Stott, L.D., **Higher temperatures and lower oceanic pCO_2 : a climate enigma at the end of the Paleocene epoch**, *Paleoceanography*, Aug. 1992, 7(4), 395-404, 34 refs.

One of the largest and most abrupt climatic warming events documented in the geologic record occurred at the end of the Paleocene epoch. Oceanic deep waters warmed to 10 C, and high-latitude surface waters warmed from 10 C to 20 C within several thousand years. This coincided with weakened atmospheric circulation and the extinction of 50% of deep-sea benthic foraminiferal species. The organic carbon bound within the calcite lattice of well-preserved planktonic foraminifera was extracted from isotopic analysis. With allowance for uncertainty in the isotopic differences between phytoplankton and foraminiferal organic matter, the initial results indicate a drop in surface ocean pCO_2 at high and low latitudes from 600-700 parts per million (ppm) to 200 ppm. Lower pCO_2 persisted for at least 10,000 years. The duration of the pCO_2 excursion was long enough for the ocean and atmosphere to have reached a new steady-state condition. There is no evidence of increased organic carbon burial in the deep sea during this period. Two alternative explanations are presented to account for such a rapid drop in oceanic pCO_2 . One involves reduced upwelling induced by diminished wind stress as atmospheric circulation weakened in response to climate warming. The second involves a readjustment of carbonate equilibria in the ocean to higher $[\text{CO}_3^{2-}]$ in the surface ocean, particularly at high latitudes where surface waters warmed to approximately 20 C. Such a shift in carbonate equilibria would have lowered the ocean's capacity to take up CO_2 . (Auth. mod.)

I-50053

Miller, J.M., Moody, J.L., Harris, J.M., Gaudry, A., **10-year trajectory flow climatology for Amsterdam Island, 1989-90**,

Atmospheric environment, Aug. 1993, 27A(12), p.1909-1916, 17 refs.

This paper documents the meteorology and flow climatology of Amsterdam I., a World Meteorological Organization baseline observatory located in the southern Indian Ocean. The island is strongly influenced by two meteorological systems: the subtropical anticyclone and the westerlies, known as the roaring forties. Westerly surface winds dominate ground-level flow on the island, which receives an annual average precipitation of 1100 mm. A 10-year back air trajectory climatology at 850 hPa to the island showed the same predominant westerly-southwesterly flow (55% of the period). Special emphasis was placed on trajectories that had their origin on the African continent because this was the predominant nonmarine source of trace materials that could be transported to Amsterdam I. This transport, most frequent in the winter and early spring, coincided with the winter peak of continental radon. A comparison of trajectories and 12-h precipitation amounts on the island showed that most of the rain coincided with southwesterly flow, but many large individual events were frequently associated with northerly and westerly flow regimes. Meteorological information about local conditions and flow climatology is necessary to aid in the interpretation of atmospheric chemistry measurements made at global stations such as Amsterdam I. (Auth.)

I-50139

Mauldin, R.L., III, **Kinetics and photochemistry of halogen oxides relevant to the stratosphere**, Boulder, University of Colorado, 1991, 178p., University Microfilms order No.92-20431, Ph.D. thesis. 3 refs.

In this study, the pulsed photolysis-kinetic spectroscopy (PP-KS) technique was used to examine some of the halogen oxide reactions which destroy ozone. The original PP-KS technique of Porter and Norrish was modified to include a photodiode array as a detection system in kinetic measurements. The rate coefficients for both channels in the self-reaction of BrO were measured as a function of temperature and pressure. A new absorbing species was detected and a reaction mechanism is proposed. Rate coefficients for the thermolecular channel of the self-reaction of ClO, critical to the calculation of the ozone depletion rate over Antarctica, were determined using various third bodies. The UV absorption cross-sections of ClOO were measured as a function of wavelength. The heat of formation of ClOO and its rate coefficient for reaction with Cl were determined. The reaction of O(sp³P) with OClO was studied. A new absorbing species was detected. The UV absorption cross-section and coefficient for appearance of this new species were measured. (Auth. mod.)

I-50140

Jones, N.B., **Application of improved nitric acid band model parameters to South Pole atmospheric emission measurements**, University of Denver, 1992, 196p., University Microfilms order No.92-19825, Ph.D. thesis. Refs.p.172-180.

The 1978 emission measurements of Williams et al., (1982) were investigated to determine whether a common analysis method could account for the higher HNO₃ column amounts retrieved from emission data with respect to later absorption studies. A multilayer, temperature dependent calculation using both band model and line by line parameters indicated that the South Pole emission measurements were consistent with the ground based absorption measurements of Murcray et al., (1987). Evaluation of the assumed HNO₃ temperature used in the original analysis indicated that this was a major contributor to the overestimate of the HNO₃ column. It was concluded therefore that the original band model parameters did not significantly contribute to the initial discrepancies. A significant part of the work was the derivation of band model parameters using the best available line parameters and experimental data. Quantum mechanical parameters were used for the central region of the 11.3 μm HNO₃ band. Temperature coefficients were calculated along with the use of experimental cross-sections to extend the useful range of band model parameters into the HNO₃ wings. It was concluded that with small absorber/emitter amounts, the new parameters were in good agreement with line by line calculations. (Auth. mod.)

I-50146

Miles, T., Grose, W.L., Remsberg, E.E., Lingenfelter, G., **Evolution of Southern Hemisphere subpolar middle atmosphere during summer and autumn**, *Journal of the atmospheric sci-*

ences, Mar. 1, 1994, 51(5), p.677-693, 74 refs.

The evolution of zonal wind and zonal wavenumber one (wave 1) in the Southern Hemisphere subpolar middle atmosphere is described for the period Dec. 1978-May 1979 using temperature and ozone measurements from the Limb Infrared Monitor of the Stratosphere (LIMS) experiment. In late Dec. maximum zonal easterlies of 70 m/s are observed at 0.1 mb, 60S. A zonal flow reversal occurs during late Feb. and westerlies subsequently increase to 60-70 m/s in the upper stratosphere by Apr.-May. LIMS zonal winds are compared with rocketsonde measurements and nadir sounder (derived) winds for summer and autumn. Although quantitative agreement is found at stratospheric levels, substantial discrepancies are evident in the mesosphere, most likely a reflection of sampling and resolution differences in the respective datasets. Stationary and traveling wave 1 temperature disturbance (amplitudes = 1-2 K at 60S) are observed by LIMS during summer. The stationary wave is confined to the lower stratosphere near the level of zero zonal-mean wind flow, whereas the traveling wave is prominent in the middle stratosphere, moves west at a rate similar to the zonal-mean wind, and exhibits a vertical-meridional structure similar to a P₄¹ normal mode Rossby wave. A substantial intensification of wave 1 activity occurs during autumn (amplitudes = 5-10 K), which is found to be associated with an upward-directed Eliassen-Palm flux near the subpolar tropopause level. Evidence relating wave 1 activity in the lower-middle stratosphere to the occurrence of zonal ozone perturbations of 10-20% amplitude is presented for summer and autumn. (Auth.)

I-50150

Comiso, J.C., **Surface temperatures in polar regions from Nimbus 7 temperature humidity infrared radiometer**, *Journal of geophysical research*, Mar. 15, 1994, 99(C3), p.5181-5200, 35 refs.

Monthly surface temperatures in the arctic and antarctic regions have been derived from the 11.5 micron thermal infrared channel of the Nimbus 7 temperature humidity infrared radiometer (THIR) for a whole year in 1979 and for a winter and a summer month from 1980 through 1985. The data set shows interannual variability and provides spatial details that allow identification of temperature patterns over sea ice and ice sheet surfaces. For example, the coldest spot in the Southern Hemisphere is consistently on the antarctic plateau, while that in the Northern Hemisphere is in Greenland, Siberia, the central Arctic, or the Canadian Archipelago. Also, in the Southern Hemisphere, the amplitude of the seasonal fluctuation of the ice sheet temperatures is about 3 times that of sea ice, while in the Northern Hemisphere the corresponding fluctuations for the two surfaces are about the same. The main sources of error in the retrieval are cloud and other atmospheric effects. Overall, the monthly maps derived from the resulting daily maps are spatially and temporally consistent, are coherent with the topography of the antarctic continent and the location of the sea ice edge, and are in qualitative agreement with climatological data. Quantitatively, THIR data are in good agreement with antarctic ice sheet surface air temperature station data. Overall, the rms error is estimated to be from 1 to 2 C, depending on the surface, while the average bias when compared with *in situ* data is less than 2 C. (Auth. mod.)

I-50173

Lachlan-Cope, T.A., Turner, J., Thomas, J.P., Rasmussen, E.A., **High latitude mesoscale atmospheric circulation features observed with the ERS-1 scatterometer**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.2, Paris, European Space Agency, 1994, p.809-814, ESA SP-361, 4 refs.

Case studies of mesoscale weather systems in the polar regions, including the Bellingshausen Sea, have been examined using scatterometer winds, other satellite data, model output and synoptic observations. The scatterometer winds produced during 1993 have been much improved over earlier releases of data and shown no 'granularity' and only limited ambiguity of the wind directions. In areas of slack pressure gradient the low wind speeds still show very variable and inconsistent directions. The long interval between passes is a significant obstacle to their use in rapidly developing situations. (Auth. mod.)

I-50177

Van den Broeke, M.R., Duynkerke, P.G., Oerlemans, J., **Observed katabatic flow at the edge of the Greenland ice sheet**

during GIMEX-91, *Global and planetary change*, Jan. 1994, 9(1-2), p.3-15, 35 refs.

Observations performed in the melting zone of the Greenland ice sheet near Søndre Strømfjord and over the adjacent tundra in the summer of 1991 are described. The katabatic wind over the ice influences the energy balance near the surface through the sensible and latent heat flux. With the aid of a tethered balloon it was observed that the thickness of the katabatic layer is typically 100 to 200 m. An interesting aspect appears to be the acceleration of the flow in the late afternoon due to the large temperature gradient at the border between tundra and ice. Further on the ice, this effect is no longer important for the dynamics of the katabatic flow, where net radiation is the main driving force. An attempt is made to estimate the importance of these thermal wind effects compared to the buoyancy forcing. It is concluded that near the edge of the ice surface winds are driven by the horizontal pressure gradient, imposed by the thermal contrast between tundra and ice. A comparison is made between the observed katabatic wind and those in the Antarctic. (Auth. mod.)

I-50181

Tarasenko, D.A., **Temperature and wind trends over East Antarctica** [Trendy temperatury i vetra nad Vostochnoi Antarktikoi], *Antarktika*, 1993, No.31, p.21-24, In Russian with English summary. 10 refs.

Analysis of long-term temperature and wind changes in the stratosphere and mesosphere is presented, based on data obtained at Molodezhnaya Station between 1971 and 1987. It is shown that the value and sign of meteorological parameter trends do not remain the same at different heights and in different months. It is suggested that the obtained trend values are regular fluctuations with a period equal to or exceeding the period studied. (Auth. mod.)

I-50182

Liubarskii, A.N., **Climatic zoning of Antarctica by automated classification methods** [Klimaticheskoe raionirovanie Antarktiki metodami avtomatizirovannoi klassifikatsii], *Antarktika*, 1993, No.31, p.25-34, In Russian with English summary. 22 refs.

Zoning of Antarctica was carried out according to mean long-term values of 7 climatic characteristics, selected as a vector of features at 30 meteorological stations, on the basis of 2 algorithms for automated classification: cluster analysis and construction of the shortest connecting network. The boundaries of 4 climatic zones, defined on the basis of each algorithm, confirm the objective character of the classification carried out. Based on the results, automated classification is considered to be more accurate than other classification methods. (Auth. mod.)

I-50183

Koshel'kov, I.U.P., Kovshova, E.N., **Long-term averages of meteorological parameter fields in the southern upper stratosphere during winter** [Srednie mnogoletnie polia meteorologicheskikh parametrov v verkhnei stratosfere Iuzhnogo polushariia dlia zimnego sezona], *Antarktika*, 1993, No.31, p.35-42, In Russian with English summary. 10 refs.

This paper deals with multiannual temperature fields and heights of isobaric surfaces 10, 5 and 2 mb in the Southern Hemisphere for June-Aug. The data were obtained by various satellite radiometers; analysis of deviations from zonal mean values was made, and amplitudes and phases of stationary waves were calculated. The predominant role of Wave 1 is shown. Its phase is practically opposite for geopotential height and temperature, leading to a substantial change of the geopotential field with altitude. (Auth.)

I-50187

Semiletov, I.P., **Paleovariations of atmospheric composition in ancient ice core air bubbles** [O paleovariatsiiakh sostava atmosfery v vozdushnykh vklucheniakh drevnikh l'dov], *Antarktika*, 1993, No.31, p.64-84, In Russian with English summary. Refs. p.82-84.

The technique of ice core gas content analysis is considered in detail. Results of recent investigations of polar ice cores are discussed. It is shown that primary air inclusions trapped during snowflake genesis might explain the discrepancy between values of the total inorganic carbon content and air CO₂ air content in polar ice cores. (Auth.)

I-50285

Ko, M.K.W., et al, **Two-dimensional model with coupled dynamics, radiation, and photochemistry. 1. Simulation of the middle atmosphere**, *Journal of geophysical research*, Nov. 20, 1993, 98(D11), p.20,429-20,440, 37 refs.

The model consists of a primitive equation dynamics module, a full radiative transfer scheme, and a comprehensive gas phase chemistry module. The circulation is derived from heating rates in the stratosphere that are calculated using model-generated ozone. In the troposphere, parameterized heating rates are adopted. The eddy momentum flux divergence in the zonal mean momentum equation is given by the eddy fluxes of potential vorticity. Eddy fluxes of potential vorticity and tracers are parameterized using a set of predetermined diffusion coefficients. The adopted values for Kyy, which are based on values derived by Newman et al. (1988), show a hemispherical asymmetry in that the values in the lower stratosphere are consistently smaller in the Southern Hemisphere. The asymmetry in Kyy and in the parameterization of the tropospheric heating rate results in an asymmetry in the circulation giving rise to unique signatures in the trace gas distributions. The model successfully simulates the observed asymmetry in the column abundance of the springtime ozone maxima between the Northern and Southern Hemisphere. Results for other trace gases are in agreement with the gross observed features although specific differences exist. Graphs used to supplement the text are variously constructed to compare the four seasons. The graphs extend from 90N to 90S through the equator. They depict diffusion coefficients; temperatures aloft, 5-80 km; mean zonal winds; vertical and horizontal wind components; ozone; mass stream functions; and mixing ratios. (Auth. mod.)

I-50286

Schneider, H.R., Ko, M.K.W., Shia, R.L., Sze, N.D., **Two-dimensional model with coupled dynamics, radiative transfer, and photochemistry. 2. Assessment of the response of stratospheric ozone to increased levels of CO₂, N₂O, CH₄, and CFC**, *Journal of geophysical research*, Nov. 20, 1993, 98(D11), p.20,441-20,449, 19 refs.

The impact of increased levels of CO₂, chlorofluorocarbons (CFCs), and other trace gases on stratospheric ozone is investigated with an interactive two-dimensional model of gas phase chemistry, dynamics, and radiation. The scenarios considered are (1) a doubling of the CO₂ concentration, (2) increases of CFCs, (3) CFC increases combined with increases of nitrous oxide (N₂O) and methane CH₄, and (4) the simultaneous increase of CO₂, CFCs, N₂O, and CH₄. The radiative feedback and the effect of temperature and circulation changes are studied for each scenario. The structure of the perturbations shows a north-south asymmetry. Ozone losses (when expressed in terms of percent changes) are generally larger in the high latitudes of the Southern Hemisphere as a result of the eddy mixing being less than in the Northern Hemisphere. Increase of chlorine leads to ozone losses above 30 km altitude, where the radiative feedback results in a cooler temperature and an ozone recovery of about one quarter of the losses predicted with a noninteractive model. In all the cases, changes in circulation are small. In the chlorine case, circulation changes reduce the calculated column depletion by about one tenth compared to off-line calculations. (Auth. mod.)

I-50308

Turco, R.P., Drdla, K., Tabazadeh, A., Hamill, P., **Heterogeneous chemistry of polar stratospheric clouds and volcanic aerosols**, NATO Advanced Study Institute on the Role of the Stratosphere in Global Change, Carqueiranne, France, Sep. 14-25, 1992. Proceedings. Edited by M.L. Chanin and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.8, Heidelberg, Springer-Verlag, 1993, p.65-134, Refs. p.125-134.

DLC QC981.8.C5 R66

In this paper, the origins and properties of sulfate aerosols, polar stratospheric clouds and other observed stratospheric particles are surveyed. Anthropogenic influences on these aerosols are discussed. The heterogeneous chemistry of polar stratospheric clouds, and the chemical processing of air in contact with such clouds, are illustrated using detailed model simulations. The injection of sulfur and chlorine into the stratosphere by volcanic eruptions is also investigated. HCl scavenging in volcanic eruption plumes is quantified based on an analysis of the dynamics, physical chemistry and microphysics of eruption columns. The potential contribution of sulfate aerosols to ozone depletion at high latitudes is discussed. Outstanding scientific issues concerning stratospheric aerosols and their chemical effects are summarized. (Auth. mod.)

I-50309

Poole, L.R., McCormick, M.P., **Major results from SAGE II, NATO Advanced Study Institute on the Role of the Stratosphere in Global Change**, Carqueiranne, France, Sep. 14-25, 1992. Proceedings. Edited by M.L. Chanin and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.8, Heidelberg, Springer-Verlag, 1993, p.377-386, 19 refs.

DLC QC981.8.C5 R66

This paper summarizes major results which have emanated from the Stratospheric Aerosol and Gas Experiment II (SAGE II), augmented by previous measurements. The spaceborne SAGE II instrument provides self-calibrating, near global measurements of atmospheric aerosols, ozone, NO₂, and water vapor. These data in conjunction with data from sister instruments can be used to estimate long-term constituent trends and identify responses to episodic events such as volcanic eruptions. Major results of these programs include illustration of the stratospheric impact of the 1991 Mount Pinatubo eruption, identification of a negative global trend in lower stratospheric ozone during the 1980s, and quantitative verification of the positive water vapor feedback in current climate models. Optical measurements of both arctic and antarctic atmospheres are also presented. (Auth. mod.)

I-50310

Stamnes, K., **Modeling of UV penetration through the atmosphere and ocean**, NATO Advanced Study Institute on the Role of the Stratosphere in Global Change, Carqueiranne, France, Sep. 14-25, 1992. Proceedings. Edited by M.L. Chanin and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.8, Heidelberg, Springer-Verlag, 1993, p.425-435, 7 refs.

DLC QC981.8.C5 R66

This paper reviews measurement of ultraviolet radiation at the ground and at various levels in the ocean to assess how changes in ozone abundance, aerosol loading and cloud cover will influence UV exposure. Included are irradiance and ozone measurements at McMurdo Station. (Auth. mod.)

I-50313

Dhaulakhandi, A.B., Joshi, R.P., Joshi, M.C., **Availability of photosynthetically active radiation in Antarctica**, *Current science*, Nov. 10, 1993, 65(9), p.703-705, 12 refs.

Variations in PAR (photosynthetically active radiation) are intense in Antarctica because of its unique polar position and weather conditions. Presented here are data on clear-day PAR variations at Maitri Station and inside the greenhouse at Maitri Station, collected during the 10th Indian Scientific Expedition to Antarctica (1990-92) for one full year. The peak levels occurred at local noon (11 h GMT). The peak level at Maitri was 89.28 klux in December, followed by 86.17 klux in January. The PAR was zero in June and July. The peak level inside the greenhouse was 50 klux in December. The PAR levels were almost symmetric with respect to the mid-point of the year. PAR decreases from January to June and then increases from August to December. (Auth. mod.)

I-50315

Tolbert, M.A., **Sulfate aerosols and polar stratospheric cloud formation**, *Science*, Apr. 22, 1994, 264(5158), p.527-528, 17 refs.

This essay provides a review into the ozone depletion problem over Antarctica since the Farman report of 1985. Details are summarized of the formation, composition, chemical reactions, and physical properties of stratospheric sulfate aerosols and polar stratospheric clouds from presentations at a Heterogeneous Chemistry Workshop held in Boulder, CO in Nov. 1993.

I-50316

Newman, P.A., **Antarctic total ozone in 1958**, *Science*, Apr. 22, 1994, 264(5158), p.543-546, 42 refs.

The antarctic ozone hole results from catalytic destruction of ozone by chlorine radicals. The hole develops in August, reaches its full depth in early October, and is gone by early December of each year. Extremely low total ozone measurements were made at the Dumont d'Urville Station in 1958. These measurements were derived from spectrographic plates of the blue sky, the moon, and two stars. These Dumont plate data are inconsistent with 1958 Dobson spectrophotometer ozone measurements, with present-day antarctic observations, and with meteorological and theoretical information. There is no credible evidence for an ozone hole in 1958. (Auth.)

I-50321

Pettré, P., **Comparison of results of a GCM simulation with observed data from automatic weather stations in Adélie Land, Antarctica** [Comparaison de résultats de simulations d'un modèle de circulation générale avec des données de stations météorologiques automatiques de Terre Adélie, Antarctique], *Académie des sciences, Paris. Compte rendus. Serie II*, Dec. 1993, 317(12), p.1583-1593, In French with abridged English version and summary. 13 refs.

The results of a 10-year numerical simulation (AMIP experiment from 1979 to 1988) of a General Circulation Model are compared with data from two automatic weather stations (AWS), one located at D-10 in a coastal region near Dumont d'Urville, the other one on the antarctic plateau at Dome C 1,000 km inland. The mean monthly temperatures show a good agreement. Nevertheless, one can see that in the simulation, temperatures are too cold during summer and that at D-10 the autumn occurs too late while at Dome C the spring is late. A good agreement is also found between the observed and simulated temperature anomalies in spite of a shift of about 2 months. A spectral analysis over a 30-year series at Dumont d'Urville confirms this result which shows a perturbation propagating with a period of 10.7 months. (Auth.)

I-50333

Gruzdev, A.N., Sitnov, S.A., **Annual variation of tropospheric ozone and estimates of tropospheric-stratospheric exchange in the Arctic and Antarctic based on ozone sounding data**, *Izvestiya. Atmospheric and oceanic physics*, 1992, 28(9), p.707-714, Translated from *Izvestiia Akademii nauk. Fizika atmosfery i okeana*. 19 refs.

The intrayear variability of tropospheric ozone in the Arctic and Antarctica is analyzed on the basis of ozone sounding data obtained over a 15-yr period at Resolute Station and a 7-yr period at Amundsen-Scott Station. The ozone content in the antarctic troposphere is lower than that in the arctic troposphere throughout the entire year. The phase of O₃ yearly variation over Resolute gradually increases from the stratosphere into the troposphere. In contrast, the phase of the yearly harmonic of O₃ above the South Pole is discontinuous near the tropopause. Stratospheric-tropospheric exchange affects the character of the intrayear variability of tropospheric ozone. The winter ozone fluxes through the tropopause are estimated. Stratospheric-tropospheric exchange also allows the effects of the antarctic ozone hole to penetrate into the upper troposphere. (Auth.)

I-50361

Andreas, E.L., Claffey, K.J., Makshtas, A.P., Ivanov, B.V., **Atmospheric sciences on Ice Station Weddell**, *Antarctic journal of the United States*, 1992, 27(5), p.115-117, 4 refs.

The broad objective of the joint U.S./Russian atmospheric sciences program on Ice Station Weddell was to understand air-ice-ocean interaction from measurements made on the air side of the interface. The core measurements of the program were made on the main meteorological

tower. At a height of 5 m, small, fast-responding instruments measured the turbulent fluctuations in the 3 wind speed components, air temperature, and water vapor density. These measurements will yield the Reynolds fluxes of momentum (the surface stress) and sensible and latent heat. The authors supplemented these direct measurements of the turbulent fluxes with profile measurements on 2 nearby masts. A full suite of radiation measurements, consisting of incoming and outgoing shortwave and longwave radiation and the shortwave and longwave balances, complemented the turbulence measurements and completes the surface energy budget. Also measured was the snow-surface temperature with a Barnes PRT-5 infrared radiation thermometer and by a hygrometric technique. When a lead opened near the camp, 15 day observations of albedo, ice thickness and salinity, and radiative and physical temperatures of the surface and near-surface water, were carried out.

I-50365

Zhang, R. Y., Jayne, J. T., Molina, M. J., **Heterogeneous interactions of ClONO₂ and HCl with sulfuric acid tetrahydrate: implications for the stratosphere**, *Journal of physical chemistry*, Jan. 20, 1994, 98(3), p.867-874, 48 refs.

This paper presents measurements of various heterogeneous reaction probabilities on sulfuric acid tetrahydrate (SAT) surfaces, conducted at reactant partial pressures characteristic of the stratosphere. Results indicate that the reaction probabilities as well as HCl uptake depend strongly on the thermodynamic state of the SAT surface, which is determined by the temperature and H₂O partial pressure in equilibrium with the solid. The H₂O-rich forms are shown to be more reactive than the H₂SO₄-rich forms. At high HCl partial pressures substantial HCl uptake is observed, most likely as a result of substrate melting. The data reveal that frozen stratospheric sulfate aerosols play an important role in chlorine activation in the winter polar stratosphere via processes similar to those occurring on polar stratospheric cloud surfaces. (Auth. mod.)

I-50366

Horn, A. B., et al, **Low-temperature infrared study of the reactions of the stratospheric NO_y reservoir species dinitrogen pentoxide with water ice, 80-160 K**, *Journal of physical chemistry*, Jan. 20, 1994, 98(3), p.946-951, 17 refs.

This paper describes a series of experiments investigating the reaction of dinitrogen pentoxide with ice films under a variety of conditions. A distinct difference in reactivity is observed that depends not only upon the amount of available water but also on the physical form of the N₂O₅. These experiments simulate certain chemical reactions prevalent in the formation of polar stratospheric clouds. (Auth. mod.)

I-50377

Hartmann, D. L., **Theoretical support for the Airborne Antarctic Ozone Experiment. Final report**, *U.S. National Aeronautics and Space Administration. Contract report*, 1992, NASA-CR-193669, 2p., N94-13465, 5 refs.

This investigation was to provide theoretical support during and after the deployment of NASA research aircraft to Punta Arenas, Chile during Aug. and Sep. 1987 to conduct the Airborne Antarctic Ozone Experiment. The experiment was very successful in demonstrating the role of anthropogenic chlorine in producing the ozone hole over Antarctica during Sep.-Oct. 1987. The PI worked primarily on using tracer data from the ER-2 aircraft to show that transport could not have caused the ozone hole in 1987, and that transport of chemical species into the polar vortex was very weak during the period of the experiment. The presence of gravity waves was also very apparent in the ER-2 data, and papers were published on this analysis and on the use of meteorological analyses to position the aircraft within the vortex.

I-50382

Japanese Antarctic Research Expedition, **Antarctic meteorological data. Vol.33. Meteorological data at Syowa Station in 1992**, Tokyo, Japan Meteorological Agency, [1993], 328p.

This set of 1992 data collected at Showa Station includes surface reports comprised of monthly and daily summaries and synoptic data; aerological data comprised of monthly summaries and upper air observations; global solar radiation measurements comprised of monthly summaries and hourly readings; atmospheric turbidity measurements comprised of

monthly and daily summaries and aerosol optical depth records; total ozone, vertical ozone and surface radiation data; sunphotometer data obtained on the icebreaker *Shirase* and en route to Dome F Camp; and surface synoptic data obtained en route from Showa Station to Dome F Camp, July 26-Aug. 15 and Sep. 23-Dec. 20. Explanatory notes for interpretation of tables and on instruments and observation techniques are included.

I-50387

Chown, S. L., Crafford, J. E., **Microhabitat temperatures at Marion Island (46 deg 54'S 37 deg 45'E)**, *South African journal of antarctic research*, 1992, 22(1-2), p.51-58, 23 refs.

Temperature data from three important invertebrate microhabitats on Marion I., viz. the base of a *Poa cookii* (Poaceae) tiller, 0.5 cm below the surface of an *Azorella* selago (Apiaceae) cushion, and 2 cm below the soil surface, are provided for the 1987/88 austral summer. The mean daily temperature varied between 10.6 C in Nov. in the *P. cookii* tiller and 7.4 C in Dec. 2 cm below the soil surface. The mean daily temperature range varied between 12.2 C in the *P. cookii* tiller and 4.4 C below the soil surface. The absolute maximum (33.8 C) and absolute minimum (-3.7 C) temperatures for the study period were recorded in Nov. in the *P. cookii* and soil microhabitats, respectively. Microhabitat temperatures were different to and often 1-4 C higher than Stevenson screen measurements. The relevance of these findings to insect consumer ecology in the terrestrial system is briefly discussed. (Auth.)

I-50436

Johnson, B. J., Deshler, T., Rozier, W. R., **Ozone profiles at McMurdo Station, Antarctica during the austral spring of 1992**, *Geophysical research letters*, Feb. 15, 1994, 21(4), p.269-272, 9 refs.

Thirty-seven vertical profiles of ozone and temperature were measured at McMurdo Station from Aug. 23-Oct. 31, 1992. Total column ozone dropped from an initial 223 Dobson Units (DU) on Aug. 24 to 158 DU on Sep. 27. The 12-20 km column reached a record low of 17 DU on Oct. 9, an 84% loss compared to the initial value of 106 DU. The most severely depleted layer was between 12 and 16 km which coincided with the volcanic aerosol layer (11-16 km) observed by aerosol counter flights and the Italian lidar at McMurdo. By the end of September the polar vortex had elongated and shifted away from McMurdo. Subsequent profiles above 20 km altitude were typically 15-20 C warmer and ozone concentrations were 50-100% higher for the remainder of the measurement period. The 12-16 km layer, however, remained 80 to 97% depleted compared to the initial profile. (Auth. mod.)

I-50437

Deshler, T., Johnson, B. J., Rozier, W. R., **Changes in the character of polar stratospheric clouds over Antarctica in 1992 due to the Pinatubo volcanic aerosol**, *Geophysical research letters*, Feb. 15, 1994, 21(4), p.273-276, 12 refs.

Vertical profiles of aerosol concentration were measured on 8 occasions from McMurdo Station between late Aug. and early Oct. 1992. Polar stratospheric clouds (PSCs) were observed on 6 of these soundings. The characteristics of PSCs and ozone were quite different above and below about 16 km. Above 16 km PSCs were variable in time, with particles >1.0 micron radius contributing significantly to the surface area, generally <8 micron²/cm³. Below 16 km the PSCs were much more stable and were dominated by high concentrations of smaller particles, <1.0 micron, with surface areas of 20-30 micron²/cm³. This lower layer coincided with the altitude of the primary Pinatubo volcanic aerosol as measured in mid-Sep. and Oct., and with the 4 km region of the atmosphere where ozone was virtually destroyed over Antarctica in 1992. (Auth. mod.)

I-50448

Nemesure, S., et al, **Impact of clouds on the shortwave radiation budget of the surface-atmosphere system for snow-covered surfaces**, *Journal of climate*, Apr. 1994, 7(4), p.579-585, 12 refs.

Recent data from the Earth Radiation Budget Experiment (ERBE) have raised the question as to whether or not the addition of clouds to the atmospheric column can decrease the top-of-the-atmosphere (TOA) albedo over bright snow-covered surfaces. To address this issue, ERBE shortwave pixel measurements have been collocated with surface insola-

tion measurements made at two snow-covered locations: the South Pole and Saskatoon, Saskatchewan. Both collocated datasets show a negative correlation (with solar zenith angle variability removed) between TOA albedo and surface insolation. Because increased cloudiness acts to reduce surface insolation, these negative correlations demonstrate that clouds increase the TOA albedo at both snow-covered locations. (Auth. mod.)

I-50451

Murphy, D.M., Fahey, D.W., **Estimate of the flux of stratospheric reactive nitrogen and ozone into the troposphere**, *Journal of geophysical research*, Mar. 20, 1994, 99(D3), p.5325-5332, 37 refs.

The globally averaged net downward annual fluxes of reactive nitrogen (NO_y) and O₃ from the stratosphere are estimated using observed correlations of N₂O with NO_y and O₃. The linearity of the observed correlations in the lower stratosphere allows the downward fluxes of NO_y and O₃ to be related to the upward flux of N₂O. The upward flux of N₂O can be calculated from a mass balance and stratospheric photochemistry. In this way, the complicated photochemistry and transport of NO_y and O₃ can be bounded by a much simpler calculation involving N₂O. The estimated NO_y net flux of 0.45 Tg (N)/yr (range 0.23-0.73) is slightly less than previous estimates, but within the range of uncertainty. Precipitation of NO_y from the antarctic winter stratosphere may be a significant fraction of the annual global flux out of the lower stratosphere. The global budget for stratospheric NO_y shows that an N₂O lifetime greater than 160 years is inconsistent with extensive mass flow through the antarctic winter vortex. The estimated O₃ flux of 3.5×10^{10} molecules/cm²/s (range 1.5-6.8) agrees well with previous estimates using completely independent techniques. (Auth. mod.)

I-50452

Collins, R.L., Nomura, A., Gardner, C.S., **Gravity waves in the upper mesosphere over Antarctica: lidar observations at the South Pole and Syowa**, *Journal of geophysical research*, Mar. 20, 1994, 99(D3), p.5475-5485, 32 refs.

Lidar observations of the mesospheric Na layer, made at the South Pole and Showa during the winters of 1990 and 1985 respectively, are used to characterize the gravity wave activity in the upper mesosphere at both sites. Strong wave activity is observed throughout the winter at both the South Pole and Showa and shows remarkable similarity with observations from several mid-latitude and low-latitude sites. The quasi-monochromatic gravity waves exhibit the same general relationships between their wavelengths, observed periods, and amplitudes as observed at lower latitudes. The average growth length of these waves is approximately 26 km, indicating that the wave field at both antarctic sites is strongly influenced by dissipation and saturation processes. The spectra and variances of the density perturbations associated with quasi-random wave field at the South Pole are reported. The mean index of the vertical wavenumber spectrum is -2.4, and the mean characteristic wavelength is 14 km. The mean index of the temporal frequency spectrum is -1.7. The mean density variance at the South Pole is (5.7%)² and is similar in magnitude to that observed at a variety of lower-latitude sites. With no tropospheric convection during the polar night and little orographic forcing over the relatively featureless antarctic plateau, these observations suggest that nonlinear processes, rather than the source characteristics, primarily determine the characteristics of the gravity wave field in the upper mesosphere. (Auth. mod.)

I-50468

Gallée, H., Schayes, G., **Development of a three-dimensional meso- Γ primitive equation model: katabatic winds simulation in the area of Terra Nova Bay, Antarctica**, *Monthly weather review*, Apr. 1994, 122(4), p.671-685, 49 refs. For other versions see 48-2139 or I-49642.

The spatial evolution of antarctic katabatic winds in the area of Terra Nova Bay is examined using the three-dimensional version of the Université Catholique de Louvain-Modèle Atmosphérique Régional (UCLMAR) mesoscale primitive equation models. The ability of the model to replicate classical linear mountain wave simulations is verified. Three-dimensional experiments are then performed for the terrain configuration of Terra Nova (Ross Sea coastal zone) using different horizontal resolutions (5, 10, and 20 km). The model converges for resolutions lower than

10 km. Results are in qualitative agreement with available observations and previous modeling work. Strong katabatic winds are simulated with a jet over Terra Nova Bay. The model successfully initiates the mesocyclonic activity in the Ross Sea due to the katabatic circulation. (Auth. mod.)

I-50501

Keller, L.M., Weidner, G.A., Stearns, C.R., **Antarctic automatic weather station data for the calendar year 1992**, Madison, University of Wisconsin, 1994, 380p.

A network of automatic weather station (AWS) units is deployed to collect antarctic surface weather observations in support of specific meteorological research projects as well as operational activities at McMurdo Station. The 1992 network consisted of 38 installed AWS units providing observations on the Ross Ice Shelf, east of the Transantarctic Mountains and north of McMurdo to the Adélie Coast, along the Antarctic Peninsula and at climatological locations such as the South Pole. Each unit measures air temperature, wind speed, and wind and air pressure at the electronics enclosure. Some AWS units also measure the relative humidity at 3 m and vertical air temperature difference between 0.5 and 3 m. Monthly and three-hourly data summaries are provided for each AWS unit.

I-50510

Chamberlin, R.A., Bally, J., **225-GHz atmospheric opacity of the South Pole sky derived from continual radiometric measurements of the sky-brightness temperature**, *Applied optics*, Feb. 20, 1994, 33(6), p.1095-1099, 7 refs.

Measurements of the atmospheric opacity of the South Pole at 225 GHz are reported for the period from day 3 to day 180 in 1992. These opacity data were derived from continual radiometric measurements of the sky-brightness temperature as a function of the zenith angle. Measurements were performed with a 225 GHz heterodyne atmospheric radiometer on loan from the National Radio Astronomy Observatory. This radiometer was previously used to characterize other candidate millimeter and submillimeter radiotelescope sites. It was found that the atmospheric opacity was below 0.098 air mass⁻¹ 75% of the time from day 3 to day 70 in 1992, and below 0.055 air mass⁻¹ 75% of the time from day 70 to day 180 in 1992. Thus, the data demonstrate that the South Pole is an excellent site for performing millimeter- and submillimeter-wavelength radio astronomy. (Auth. mod.)

I-50538

Budd, W.F., Rayner, P., **Modelling ice sheet and climate changes through the ice ages**, NATO Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.291-319, 44 refs.

A three-dimensional ice sheet model and a global energy balance climate model have been used to investigate the evolution of ice and climate changes through the ice ages. Sensitivity studies give an indication of the conditions required for the growth and decay of the ice sheets. Time series simulations in response to orbital forcing show the dominance of ice sheets in the climate system in converting seasonal and latitudinal variations into annual and global changes, although with a large phase shift. Explicit calculations of phase differences show a sequence of leads and lags through July radiation, July temperature, ice area and annual mean temperature, ice volume and sea level, ocean $\delta^{18}\text{O}$, January temperature, January radiation and finally bedrock depression. The recognition of these phase shifts, caused primarily by the slow ice sheet response and feedback, may assist the interpretation of phase differences observed in proxy paleorecords. Both arctic and antarctic ice sheets are included in the simulations. (Auth. mod.)

I-50541

Yiou, P., Ghil, M., **Nonlinear paleoclimatic variability from Quaternary records**, NATO Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.557-577, 41 refs.

Stable-isotope records from 7 marine cores and one antarctic ice core provide invaluable information on the intricate behavior of the climatic system over time scales of 10^4 to 10^5 years. These records, in conjunction with a simple coupled climate model, clarify major mechanisms of paleo-climatic variability. The time intervals covered by the records include the last glacial-interglacial cycle. In spite of the difference in the nature of the records, common features are revealed by advanced spectral-analysis tools. The dominant features are the presence of orbital frequencies on the one hand, and a low number of internal degrees of freedom on the other. The climatic system appears therefore to act on the Quaternary time scales considered as a forced nonlinear oscillator. The internal mechanisms giving rise to the aperiodic oscillations include ice-albedo feedback, precipitation-temperature feedback, and interactions between ice sheets and bedrock. (Auth. mod.)

I-50580

Quintern, L.E., et al, **Continuous dosimetry of the biologically harmful UV-radiation in Antarctica with the biofilm technique**, *Journal of photochemistry and photobiology, B: Biology*, Jan. 1994, 22(1), p.59-66, 32 refs.

For the first time, a continuous biological dosimetry experiment for cytotoxic solar UV-radiation has been performed in Antarctica. The biologically harmful UV-radiation on the ground was measured at Georg von Neumayer Station from Dec. 1990 to Mar. 1992 using the biofilm technique. The UV-sensitive targets were dried spores of *Bacillus subtilis* which were immobilized on the film surface. The UV-induced inhibition of biological activity, determined photometrically from the protein synthesized after incubation and staining, was taken as a measure for the absorbed UV-dose. Films were exposed in a horizontal position for time intervals ranging from 4 days during summer up to 51 and 41 days before and after the polar night respectively. The use of different cut-off filters allowed the calculation of the biologically effective UVA, UVB and the complete UV-radiation (UVA+B). The data were compared with the global radiation and the ozone column thickness indicating an increase of biologically harmful UVB radiation during austral spring at reduced ozone concentrations, yielding a radiation amplification factor (RAF) of 1.4, whereas for the total UV(A+B) range the RAF amounted to 0.3. (Auth.)

I-50585

Pierce, R.B., Grose, W.L., Russell, J.M., III, Tuck, A.F., **Evolution of Southern Hemisphere spring air masses observed by HALOE**, *Geophysical research letters*, Feb. 1, 1994, 21(3), p.213-216, 7 refs.

The evolution of Southern Hemisphere air masses observed by the Halogen Occultation Experiment (HALOE) during Sep. 21 through Oct. 15, 1992, is investigated using isentropic trajectories computed from United Kingdom Meteorological Office (UKMO) assimilated winds and temperatures. Maps of constituent concentrations are obtained by accumulation of air masses from previous HALOE occultations. Lagged correlations between initial and subsequent HALOE observations of the same air mass are used to validate the air mass trajectories. High correlations are found for lag times as long as 10 days. Frequency distributions of the air mass constituent concentrations are used to examine constituent distributions in and around the Southern Hemisphere polar vortex. (Auth.)

I-50587

López-Valverde, M.A., López-Puertas, M., Marks, C.J., Taylor, F.W., **Global and seasonal variations in middle atmosphere CO from UARS/ISAMS**, *Geophysical research letters*, June 18, 1993, 20(12), p.1247-1250, 10 refs.

Carbon monoxide limb emissions at 4.6 microns measured by the Improved Stratospheric and Mesospheric Sounder (ISAMS) on board the Upper Atmosphere Research Satellite (UARS) are presented. The main features observed in the radiance measurements are presented and discussed. These radiances are used to obtain the CO abundances in the middle atmosphere, using a special retrieval scheme which incorporates the non-LTE nature of the CO emission at 4.6 microns. The first global maps of the CO abundance in the middle atmosphere illustrating its latitudinal/seasonal variations are presented and briefly discussed. One of the most interesting results obtained is the increase in the CO relative abundance in the mesosphere towards the winter polar region, in accordance with previous predictions by 2D dynamical-chemical models of the middle atmo-

sphere. Measurements were made on Nov. 15, 1991, and on that day the mode and geometry of the observations gave good areal coverage from 80S to 10N for daytime and from 10N to 80N for nighttime. (Auth. mod.)

I-50588

Fishbein, E.F., et al, **MLS observations of stratospheric waves in temperature and O₃ during the 1992 southern winter**, *Geophysical research letters*, June 18, 1993, 20(12), p.1255-1258, 13 refs.

The Microwave Limb Sounder observed waves in stratospheric temperature and O₃ during the 1992 southern winter. Wave 1 intensifies three times from mid-Aug. through mid-Sep., when a 9 day eastward traveling wave becomes in phase with the stationary wave 1. During the periods of wave intensification, minor sudden warmings and increased zonal mean O₃ are observed. The waves have a westward phase tilt which results in an intensified baroclinic zone when the waves are in phase. Waves in T and O₃ are positively correlated near 5-10 hPa, implying transport by planetary waves; this is supported by larger O₃ wave amplitudes than expected from photochemistry alone. (Auth.)

I-50609

Roy, C.R., Gies, H.P., Tomlinson, D.W., Lugg, D.L., **Effects of ozone depletion on the ultraviolet radiation environment at the Australian stations in Antarctica**, *American Geophysical Union. Antarctic research series*, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.1-15, Refs. p.13-15.

DLC QH84.2.U515

Since 1987 all years except 1988 have resulted in large and deep ozone holes during the austral spring over Antarctica. The dynamic nature of the polar vortex containing the ozone hole has meant that large changes in ultraviolet radiation levels are occurring at the Earth's surface during the Sep. to Nov. period. These changes can occur on time scales of several days or less. Radiation levels are controlled largely by atmospheric ozone, cloud cover, and the solar zenith angle. This changing environment dictates an expansion of the research into the associated biological effects. The three Australian antarctic stations lie in the narrow latitude band of 67.5S and cover the longitude arc of 62.9-110.5E. Ultraviolet measurements have been made at the stations since 1989, and some results and possible biological implications are discussed. (Auth.)

I-50610

Booth, C.R., et al, **United States National Science Foundation's polar network for monitoring ultraviolet radiation**, *American Geophysical Union. Antarctic research series*, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.17-37, Refs. p.36-37.

DLC QH84.2.U515

The development of a high-latitude monitoring network for ultraviolet radiation (UV) in Antarctica was initiated in 1987 through the United States Antarctic Program, National Science Foundation. This network was established in 1988 and presently consists of six monitoring stations: three in Antarctica, one in Ushuaia, Argentina, one at Barrow, AK, and one at San Diego, CA. High-resolution (0.7 nm) spectral scans are made hourly, and data are routinely distributed to scientists around the world. This chapter presents details of the instrumentation and an overview of the data that have been collected. (Auth.)

I-50611

Booth, C.R., Madronich, S., **Radiation amplification factors: improved formulation accounts for large increases in ultraviolet radiation associated with antarctic ozone depletion**, *American Geophysical Union. Antarctic research series*, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.39-42, 9 refs.

DLC QH84.2.U515

Radiation amplification factors (RAF) are being increasingly used to convey the relative increase in harmful UV radiation with decrease in ozone concentration. However, the indiscriminate use of simple linear RAF extrapolation may lead to serious underestimates of UV radiation

when large changes of ozone concentration are involved. Using spectral irradiance data measured at the South Pole during the 1990 and 1991 austral summers, UV enhancement predicted with a traditional linear RAF formulation is contrasted with a nonlinear alternative formulation. The analysis shows that significant discrepancies occur where ozone depletion exceeds 25%. (Auth.)

I-50612

Frederick, J.E., Lubin, D., **Solar ultraviolet irradiance at Palmer Station, Antarctica**, *American Geophysical Union. Antarctic research series*, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.43-52, 12 refs.

DLC QH84.2.U515

Measurements of the solar ultraviolet irradiance have been made at Palmer Station on the Antarctic Peninsula since 1988. The annual depletion of ozone over Antarctica appears in the data set as a period of enhanced irradiances during spring. Cloudiness manifests itself as an erratic variability imposed on a large annual cycle associated with the elevation of the Sun above the horizon and the duration of daylight. During the first year of observations, 1988, the ozone depletion dissipated in Nov., and the maximum ultraviolet irradiance observed during the spring season occurred in the middle of Oct. At this time the irradiance at local noon, integrated over the spectral interval 295 to 305 nm, was similar to the largest value observed near summer solstice when the Sun reaches its highest point in the sky. In 1990, low ozone values persisted over the Antarctic Peninsula into Dec. The combination of reduced ozone amounts and the high solar elevation led to ultraviolet irradiances which were 50-100% higher than the maximum values normally experienced by the region. (Auth.)

I-50613

Lubin, D., Ricchiazzi, P., Gautier, C., Whritner, R.H., **Method for mapping antarctic surface ultraviolet radiation using multi-spectral satellite imagery**, *American Geophysical Union. Antarctic research series*, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.53-81, Refs. p.80-81.

DLC QH84.2.U515

Images from the advanced very high resolution radiometers (AVHRR) aboard the NOAA polar orbiters can be used in conjunction with data from the Nimbus 7 total ozone mapping spectrometer (TOMS) to construct maps of biologically active ultraviolet irradiance at the antarctic earth surface. A method to perform this mapping which involves refinements to the satellite data as well as detailed radiative transfer theory is described. A surface albedo map can be constructed for the region and time period of interest by compositing as many cloud-free AVHRR images as are available. The optical depth of clouds over the open ocean can be estimated from AVHRR visible channel imagery by direct application of a delta-Eddington radiative transfer model. Over snow and ice, radiative transfer limitations require the use of an empirical parameterization for cloud optical depth as a function of the brightness temperature difference between AVHRR thermal channels 3 and 4. This parameterization is derived for cloud field over the ocean and applied to nearby cloud fields over snow and ice. (Auth. mod.)

I-50614

Gautier, C., He, G., Yang, S., Lubin, D., **Role of clouds and ozone on spectral ultraviolet-B radiation and biologically active UV dose over Antarctica**, *American Geophysical Union. Antarctic research series*, 1994, Vol.62, Ultraviolet radiation in Antarctica: measurements and biological effects. Edited by C.S. Weiler and P.A. Penhale, p.83-91, 12 refs.

DLC QH84.2.U515

Clouds have a profound effect on UV-B radiation, and their variations have a higher correlations with UV-B variations than ozone does. Correlation coefficients between DNA effective radiance and ozone are higher during the ozone hole, while correlations between DNA effective radiance and clouds are higher and more constant when the ozone concentration is higher. High variations of the ratio of DNA effective radiance to ultraviolet-A (UV-A) mainly results from ozone variations, but a high positive correlation also exists during part of the studied period between the ratio of

DNA effective radiance to UV-A and the cloud transmittance, while a negative correlation exists near the end of that period. Radiative transfer computations show that a positive correlation is expected when the surface is covered by snow/ice and a negative correlation can exist when the surface is mixed with open ocean. Thus clouds can affect the ratio of DNA effective radiance to UV-A, but this effect is modulated by surface processes through multiple reflections between the surface and the clouds. (Auth. mod.)

I-50624

Kalicharran, S., Diab, R.B., Sokolic, F., **Trends in total ozone over southern African stations between 1979 and 1991**, *Geophysical research letters*, Dec. 23, 1993, 20(24), p.2877-2880, 12 refs.

Trends in total ozone for the period 1979 to 1991 over the southern Africa subcontinent and the southern islands of Marion and Gough and the South African SANAE Station are examined. Version 6 TOMS data are used. With the exception of the low latitude stations (Nairobi and Harare), where a marginally increasing trend (+0.2% and +0.3%, respectively) was observed, the other stations all exhibited a decreasing trend in total ozone over the 13 year period, ranging between -1.1 and 2.6% over most of South Africa, increasing with latitude to reach -20.6% at SANAE. Inter-annual fluctuations at Nairobi are dominated by a QBO, with maximum ozone occurring during the westerly phase of the QBO. At the extratropical locations, ozone peaks and troughs are anti-correlated with those at Nairobi and the QBO signal is less well developed and modulated by the seasonal cycle. (Auth.)

I-50625

Newell, R.E., Zhu, Y., **Tropospheric rivers: a one-year record and a possible application to ice core data**, *Geophysical research letters*, Jan. 15, 1994, 21(2), p.113-116, 15 refs.

The morphology of tropospheric rivers has been examined for the period June 1991-May 1992 from atmospheric specific humidity and wind velocity data. Vertically integrated water vapor flux vectors were subjected to harmonic analysis. The high frequency components (periods less than 3 days) show large amplitude values in the North Atlantic, North Pacific, South Atlantic, South Indian Ocean and South Pacific plus small amplitude occurrences in the Red Sea-Arabian Sea region in the Dec.-Feb. season. In June-Aug. the latter is replaced with a large amplitude monsoon-related region over Southeast Asia. Maximum intensities increase slightly in altitude with latitude. The correspondence between rivers, frontal boundaries and storm tracks is noted. Sometimes rivers originating over the North Pacific cross North America and reach Greenland while at other times they pass polewards over the North Atlantic, raising the possibility that water vapor involved in ice core formation may have evaporated from surface water bodies with different temperature and salinity characteristics. Changes in oxygen isotope variations at a point may therefore reflect changes in the dynamics of tropospheric rivers in addition to local temperature changes. (Auth.)

I-50632

Hofmann, D.J., et al, **Record low ozone at the South Pole in the spring of 1993**, *Geophysical research letters*, Mar. 15, 1994, 21(6), p.421-424, 8 refs.

On Oct. 12, 1993, a balloon-borne ozone detector recorded a total ozone value of 91 +/- 5 Dobson Units (DU) at Amundsen-Scott Station. This is the lowest value of total ozone ever recorded anywhere, 13% below the previous low of 105 DU at the south pole in Oct of 1992. A region with a thickness of 5 km, from 14 to 19 km, was totally devoid of ozone as compared to only about half this thickness for the ozone void in 1992. Sub-100 DU total ozone values were observed on several soundings during 1993 whereas the 105 DU value was observed on only one occasion in 1992. The vertical profile of ozone indicates that the main reason for the record low ozone values in 1993 was an approximately 1 km upward extension of the ozone hole caused by unusual ozone loss in the 18-23 km region. Temperatures in this region were unusually low in Sep. and Oct. Thus, the extension of the ozone hole may have been the result of the prolonged presence of polar stratospheric clouds at 18-23 km combined with the continued presence of sulfate aerosol from the Pinatubo eruption and, finally, increased chlorine levels. This scenario resulted in elevated ozone loss in a region where the ozone loss process is normally not saturated. (Auth. mod.)

I-50633

Larsen, N., **Impact of freezing of sulfate aerosols on the formation of polar stratospheric clouds**, *Geophysical research letters*, Mar. 15, 1994, 21(6), p.425-428, 18 refs.

In simulation models used to describe the formation of polar stratospheric clouds (PSC), it is usually assumed that the background population of sulfate aerosols acts as nucleation centers for the PSCs. At normal stratospheric temperatures the aerosols are in the liquid phase, not suitable for PSC nucleation, but still it has been assumed that the particles will freeze above the nitric acid trihydrate (NAT) condensation temperature. Homogeneous freezing of aerosol particles into sulfuric acid tetrahydrate and ice has been incorporated in a detailed microphysical PSC model to investigate the impact of freezing among the sulfate aerosols on the PSC size distributions. It is demonstrated here that freezing of the largest particles might explain the observed high HNO_3/NAT saturation ratios and denitrification by particle sedimentation in the arctic stratosphere. Comparisons have also been made to PSC formation under antarctic temperature conditions. (Auth. mod.)

I-50638

Bartarya, S.K., Pourchet, M., Pinglot, J.F., **Distribution and fall-out of ^{137}Cs and other radionuclides over Antarctica**, Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic, Kirkenes, Norway, Aug. 23-27, 1993. Edited by P. Strand and E. Holm, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, p.201-205, 5 refs.

This paper aims to show the distribution pattern and factors controlling the variation in distribution and fallout of ^{137}Cs and other radionuclides (^{90}Sr , ^3H and ^{210}Pb). A budget of fluxes of ^{137}Cs between 1955 and 1980 has been calculated. On an average, 760×10^{12} Bq of ^{137}Cs has been deposited in Antarctica, which represents about 0.08% of the total ^{137}Cs deposited in the world. The total flux in Antarctica is about 3.1% of the mean total flux worldwide. (Auth. mod.)

I-50642

Pereira, E.B., Johnson G., E., **Transport of radon between South America and the Antarctic Peninsula**, Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic, Kirkenes, Norway, Aug. 23-27, 1993. Edited by P. Strand and E. Holm, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, p.221-224, 4 refs.

Concentrations and activity ratios of ^{222}Rn and ^{220}Rn for Punta Arenas and the Antarctic Peninsula are presented and discussed in this paper. The estimated mean transit time for radon between South America and Antarctica was about 24 to 28 hours which corresponds to transport velocities of 15.6 to 18.3 m/s. Dilution factors ranged from 2.7 to 17. (Auth.)

I-50688

Callaghan, R., et al, **Laboratory simulation of polar stratospheric clouds**, *Geophysical research letters*, Mar. 1, 1994, 21(5), p.373-376, 32 refs.

A flow cell built to simulate heterogeneous reactions in the stratosphere is described. Small particles (1 micron diameter) have been made from nitric acid solutions and distilled water. These have many of the important physical properties of types I and II polar stratospheric clouds (PSCs), respectively. The FTIR (Fourier transform infrared) spectra of the ice particles are compared with calculated extinction (scattering plus absorption) spectra to obtain an estimate of their size distributions. The average particle size can be controlled by varying the flow conditions. The nitric acid particles have not been as well characterized, because the required optical constants are not yet available. Their spectra, however, have the characteristics expected for type I PSCs, and resemble those previously reported for thin-film nitric acid trihydrate. (Auth. mod.)

I-50690

Dominé, F., et al, **Diffusion and solubility of HCl in ice: preliminary results**, *Geophysical research letters*, Apr. 1, 1994, 21(7),

p.601-604, 17 refs.

In an experiment relevant to the formation of polar stratospheric clouds, the diffusion and solubility of HCl in ice have been measured between -5 and -15 C by exposing large single crystals of ice to low vapor pressures of HCl for several days. The solubility is found to be $(1.0 \pm 0.15) \times 10^{-4}$ mol/l at -15 C under a 5.6×10^{-4} Pa HCl partial pressure. The diffusion coefficient is of the order of 10^{-12} cm²/s at -8 C, but the determination of the value is affected by small angle boundaries, where HCl motion is much faster. Extrapolation of these results suggests that HCl is not incorporated into stratospheric ice crystals. (Auth. mod.)

I-50691

Genthon, C., **Antarctic climate modeling with general circulation models of the atmosphere**, *Journal of geophysical research*, June 20, 1994, 99(D6), p.12,953-12,961, 26 refs.

The abilities of the National Aeronautic and Space Administration Goddard Institute for Space Studies (GISS) and METEO-FRANCE Arpège General Circulation Models (GCMs) of the atmosphere to simulate surface climate variables that have direct and indirect impacts on the mass balance of the antarctic ice sheet are evaluated. Deficiencies in reproducing the surface temperature are identified. Some of the flaws are associated with an incorrect specification of the antarctic continent real topography, a problem which can be partially corrected by an adequate processing of model output. Shortcomings can also result from the use of inappropriate climate variable formulations and prescribed boundary conditions. A coarse-resolution version of the GISS GCM is used to demonstrate how model results can be improved if snow albedo and sea ice coverage are more adequately set. A barrier to model validation is the lack of reliable observational data. This point is crucial for accumulation, a first-order term in the ice sheet mass balance. Finally, typical GCM resolution remains an essential limitation to improving model performances and promoting the effective use of model results for the antarctic region. (Auth. mod.)

I-50692

Poole, L.R., Pitts, M.C., **Polar stratospheric cloud climatology based on Stratospheric Aerosol Measurement II observations from 1978 to 1989**, *Journal of geophysical research*, June 20, 1994, 99(D6), p.13,083-13,089, 23 refs.

The probability of polar stratospheric cloud (PSC) occurrence in the Antarctic and Arctic has been estimated using Stratospheric Aerosol Measurement (SAM) II aerosol extinction data from 1978 to 1989. Antarctic PSCs are typically observed by SAM II from mid-May to early Nov., with a maximum zonal average probability of about 0.6 at 18-20 km in Aug. The typical arctic PSC season extends only from late Nov. to early Mar., with a peak zonal average probability of about 0.1 in early Feb. at 20-22 km. There is considerable year-to-year variability in arctic PSC sightings because of changes in the dynamics of the northern polar vortex. Year-to-year variability in antarctic sightings is most prominent in the number of late season clouds. Maximum PSC sighting probabilities in both polar regions occur in the region from 90W through the Greenwich meridian to 90E, where temperatures are coldest on average. Arctic sighting probabilities approach zero outside this region, but clouds have been sighted in the Antarctic at all longitudes during most months. Inferred PSC formation temperatures remain constant throughout the arctic winter and are similar to those in early antarctic winter. PSC formation temperatures in the Antarctic drop markedly in the 15 to 20 km region by Sep., a pattern consistent with the irreversible loss of HNO_3 and H_2O vapor in sedimenting PSC particles. (Auth. mod.)

I-50693

Mosley-Thompson, E., et al, **Climate of the last 500 years: high resolution ice core records**, *Quaternary science reviews*, July 1993, 12(6), p.419-430, 48 refs.

Precipitation accumulating on the Earth's ice sheets and ice caps records a variety of physical and chemical information about the atmosphere, and in some cases provides unique insight into both the history and the mechanics of the Earth's environmental system. High resolution (well-dated) dust records from both polar ice sheets suggest a linkage between increased atmospheric dust and cooler temperatures over Antarctica, but a similar relationship is not observed in ice cores from either Greenland or

China. Net accumulation histories for the last 490 years reveal no discernible global pattern, although interesting regional differences and similarities exist. (Auth.)

I-50694

Broecker, W.S., Peng, T.H., **What caused the glacial to interglacial CO₂ change**, Washington, D.C., U.S. Department of Energy, 1991, 23p., DE92-007247, 26 refs. Presented at the 2nd Global Cycle Meeting, Ciocco, Italy, Sep. 8-20, 1991.

Scenarios put forward to explain the 80 microatm, an increase from 200 to 280 ppm, glacial to interglacial change in atmospheric CO₂ content are evaluated. The conclusion is that no single mechanism is adequate. Rather, contributions from temperature, sea ice, biologic pumping, nutrient deepening, and CaCO₃ cycling must be called upon. The observation that the ¹³C/¹²C ratio for antarctic foraminifera was 0.9 +/- 0.1 per mill lower during glacial than during interglacial time constitutes a huge fly in the ointment for all scenarios proposed to date since it indicates that less CO₂ than expected combined with CaO to be deposited as CaCO₃ in deep sea sediments and therefore more should have been available for the increase in atmospheric CO₂ than is accounted for. It is suggested that much of the unaccounted CO₂ may have been deposited as CaCO₃ in the growth of coral reefs during deglaciation. (Auth. mod.)

I-50707

Nishimura, J., **Hunting phenomena of the balloon motions observed over Antarctica**, *Journal of aircraft*, May-June 1994, 31(3), p.538-541, 4 refs.

It has been reported that strong hunting motions of balloons were observed just after reaching the ceiling altitude for the balloons launched at Antarctica in the daytime. Such hunting motions are observed at middle latitude only for nighttime launching. In this article, a thermal analysis of the balloon motions is performed by considering the atmospheric temperature and the environmental radiation conditions at the balloon altitudes. The hunting phenomena of balloons over summer are caused by thermal conditions similar to those encountered by flights at night over the mid-latitudes. (Auth. mod.)

I-50709

Hao, C.J., Zhang, L., Xue, Z.H., Xie, S.M., **Antarctic sea ice and ENSO event**, *Acta oceanologica Sinica*, 1993, 12(4), p.549-561, 7 refs.

The characteristic low-frequency oscillation of the sea surface temperature anomaly (SSTA) of El Niño Southern Oscillation (ENSO) related region, Niño 1+2, Niño 3, Niño 4 and Niño West, and the Southern Oscillation index (SOI) are analyzed by the method of maximum entropy spectrum. Antarctic sea ice is divided into 4 regions, i.e. East Antarctic is Region I (0-120E), the region dominated by Ross Sea is Region II (120E-120W), the region dominated by Ross Sea ice is Region III (120W-0), and the whole antarctic sea ice area is Region IV. Also, the month-to-month correlation series of the sea ice with ENSO from the present to 5 years lag is calculated. The optimum correlation period is selected from the series. (Auth. mod.)

I-50710

Strahan, S.E., Mahlman, J.D., **Evaluation of the SKYHI general circulation model using aircraft N₂O measurements. 1. Polar winter stratospheric meteorology and tracer morphology**, *Journal of geophysical research*, May 20, 1994, 99(D5), p.10,305-10,318, 28 refs.

Winter polar stratospheric nitric oxide (N₂O) measurements made during two NASA polar aircraft field campaigns are used to evaluate the dynamics of the Geophysical Fluid Dynamics Laboratory's "SKYHI" general circulation model. The model has been integrated a total of 20 months, producing one antarctic and two arctic winters. The climatologies of these winters are compared with the known northern and southern hemisphere climatologies and to the meteorological conditions during the time of the field campaigns. The two arctic SKYHI winters show considerable interannual variability. In the lower stratosphere, SKYHI realistically simulates the magnitude and variability of winds and temperatures both inside and outside the polar vortex and can produce a credible sudden warming. In the Antarctic the magnitude and variability of winds and temperatures around the polar vortex are quite realistic, but inside the vortex, tempera-

tures are too low. In the Antarctic, model mixing ratios are too high everywhere and the edge gradients are flatter than the observed gradients. The comparison of mean N₂O fields suggests realistic wave activity in the SKYHI arctic winter but inadequate wave activity in the SKYHI antarctic winter. (Auth. mod.)

I-50711

Strahan, S.E., Mahlman, J.D., **Evaluation of the SKYHI general circulation model using aircraft N₂O measurements. 2. Tracer variability and diabatic meridional circulation**, *Journal of geophysical research*, May 20, 1994, 99(D5), p.10,319-10,332, 13 refs.

Winter polar stratospheric nitrous oxide (N₂O) measurements made during two NASA polar aircraft field campaigns provide a unique opportunity to evaluate the performance of the 1 deg latitude resolution version of the Geophysical Fluid Dynamics Laboratory's "SKYHI" general circulation model. This high-resolution model has been integrated 20 months, producing one antarctic and two arctic winters. Power spectra of the dynamically controlled tracer N₂O are used as a diagnostic of wave activity. Comparison of the spectra of SKYHI and the observations shows that the SKYHI arctic winter lower stratosphere is dynamically active enough to generate realistic mesoscale tracer variability but that the SKYHI antarctic has deficient variability at scales of 200-3000 km. This analysis shows that variability from "slow" processes such as planetary wave breaking dominates and is generated in realistic amounts in the SKYHI arctic winters. The SKYHI antarctic vortex shows insufficient "debris" from planetary wave breaking at scales below 700 km. In the Arctic, SKYHI temperatures, spectral results, and realistic N₂O gradients at the vortex edge suggest a reasonable diabatic meridional circulation and transport. Antarctic spectral results, low vortex temperatures, and flatter N₂O gradients at the edge all support the conclusion that the diabatic circulation and wave activity in the model Southern Hemisphere is too weak. (Auth. mod.)

I-50712

Martinerie, P., et al, **Air content paleo record in the Vostok ice core (Antarctica): a mixed record of climatic and glaciological parameters**, *Journal of geophysical research*, May 20, 1994, 99(D5), p.10,565-10,576, 49 refs.

A high-resolution air content profile (more than 1000 measurements) covering approximately the last 200,000 years was obtained along the 2546 m long Vostok ice core. Three analytical techniques were used, leading to consistent results which show large amplitude and rapid air content variations. The Vostok results support thicker/thinner ice in the central part of East Antarctica during warm/cold periods. However, constraints imposed by ice sheet dynamics suggest that the Vostok air content signal cannot be interpreted only in terms of ice sheet thickness variations. Apart from ice thickness changes, the two other potential sources of air content variations are atmospheric pressure and ice porous volume at the air isolation level. On the basis of new data concerning the present day ice porous volume variations it is suggested that a wind influence on ice porous volume at the air isolation level could be a source of the unexplained air content variations at Vostok. Equivalent contributions from elevation, air pressure, and nonthermal porous volume changes could explain the air content drop during the penultimate deglaciation. Wind speed changes by about 7 m/s could be the source of the large and rapid air content variations observed during glacial stages. (Auth. mod.)

I-50725

Hurrell, J.W., Van Loon, H., **Modulation of the atmospheric annual cycle in the Southern Hemisphere**, *Tellus*, May 1994, 46A(3), p.325-338, Refs. p.337-338.

The annual cycle in pressure and winds at the middle and high latitudes of the Southern Hemisphere changed appreciably in the troposphere after the late 1970s. Before that time, its major component over most of the southern oceans and the Antarctic was a semiannual oscillation (SAO) which had maxima in the equinoctial seasons over the middle latitude oceans and in the solstitial seasons over the Antarctic south of 60S. The SAO weakened after the late 1970s because of significant decadal changes in the monthly means, primarily during the second half of the year. A result was that the polar vortex in the troposphere, which normally weakens after a peak in late Sep. and early Oct., remained strong into Nov., and the breakdown of the stratospheric polar vortex was similarly delayed. It

is suggested that the changes in the SAO, the circumpolar trough, and the polar vortex are related to the concurrent rise of sea surface temperatures at low latitudes. The delayed breakdown of the polar vortex in the troposphere and lower stratosphere which happened after the late 1970s was coincident with the beginning of the ozone deficit in the antarctic spring. This points to a strong dynamical influence on ozone levels. (Auth. mod.)

I-50764

Kondo, Y., et al, **Ground-based measurements of column amounts of NO₂ over Syowa Station, Antarctica**, *Journal of geophysical research*, July 20, 1994, 99(D7), p.14,535-14,548, 43 refs.

The column amounts of NO₂ have been measured using visible spectroscopy at Showa Station from Mar. 1990. The NO₂ slant column amount at a solar zenith angle of 90 deg exhibits a large seasonal variation, reaching the minimum value of $1 \times 10^{16}/\text{cm}^2$ or less in midwinter, and increasing to the maximum value of $17 \times 10^{16}/\text{cm}^2$ in midsummer. The recovery of NO₂ in spring is 2-3 times slower than the fall decay. The observed temperature indicates that polar stratospheric clouds (PSCs) are expected to form from midwinter to early spring. A decrease in ozone was observed from early Aug. and continued to the end of Sep., which is consistent with the observed depletion in NO₂ during the same period. A chemical box model has been used to interpret quantitatively these observed results. The observed NO₂ values in fall are in agreement with the box model including only gas phase chemistry or with heterogeneous chemistry on background sulfuric acid aerosols. In addition, the very low NO₂ amounts and slow rate of increase observed from midwinter to early spring agree well with the model results assuming heterogeneous chemistry on PSCs. The reduction of NO₂ levels in midsummer of 1991 and 1992 below those of midsummer in 1990 was probably due to the transport of air from lower latitudes, where NO₂ is already reduced by volcanic aerosols. NO₂ and O₃ values in Oct. 1992 were much reduced as compared with those for 1990 and 1991, reflecting the difference in the location of the vortex boundary relative to Showa Station. (Auth. mod.)

I-50876

Yiou, P., et al, **Nonlinear variability of the climatic system from singular and power spectra of Late Quaternary records**, *Climate dynamics*, June 1994, 9(8), p.371-389, 93 refs.

Stable-isotope records from seven marine cores and one antarctic ice core provide valuable information on the intricate behavior of the climatic system over time scales of 10^4 to 10^5 years. These records in conjunction with a simple coupled climate model improve the understanding of major mechanisms of paleoclimatic variability. The time intervals covered by the records include the last glacial-interglacial cycle. In spite of the difference in the nature of the records, common features are revealed by advanced spectral-analysis tools. The dominant features are the presence of orbital frequencies on the one hand, and a low number of internal degrees of freedom on the other. The climatic system appears therefore to act on the Quaternary time scales considered as a forced nonlinear oscillator. The internal mechanisms giving rise to the aperiodic oscillations include ice-albedo feedback, precipitation-temperature feedback, and interactions between ice sheets and bedrock. (Auth. mod.)

I-50877

Isaksson, E., Karlén, W., **High resolution climatic information from short firn cores, western Dronning Maud Land, Antarctica**, *Climatic change*, Apr. 1994, 26(4), p.421-434, 34 refs.

Ten-meter firn cores were collected during the Swedish Antarctic Expedition to Queen Maud Land in 1988-89. The oxygen isotope stratigraphy in the cores was used to obtain a proxy-temperature record and a surface accumulation record for the last 15-30 years. The $\delta^{18}\text{O}$ record from cores on the ice shelf and the escarpment area below 2000 m a.s.l. show high variability and little year-to-year correspondence with the temperature record from nearby Halley. A stacked firn core record was produced to avoid local variability and minor dating errors; this record shows more similarities to the Halley temperature record. The $\delta^{18}\text{O}$ records from high-altitude cores show a much better correspondence to the Halley temperature record over the last 30 years, implying that the source of precipitation is more stable compared to the coastal area. The well-developed $\delta^{18}\text{O}$ stratigraphy in the cores from coastal Queen Maud Land makes it promising for future work using ice cores as paleoclimatic records. (Auth. mod.)

I-50878

Delmas, R.J., **Ice records of the past environment**, *Science of the total environment*, Mar. 31, 1994, 143(1), Interdisciplinary Conference of the Federation of European Chemical Societies on Environmental Issues, 1st. Budapest, Hungary, May 10-14, 1992. Proceedings, p.17-30, 48 refs.

It has been found from deep antarctic and Greenland ice core studies that, in comparison with present climate, ice age environmental conditions correspond to about 6°C cooler temperatures and atmospheric CO₂ and CH₄ contents lower by factors of nearly 2 and 4, respectively. The biogeochemical cycles of S and N were also affected by climatic changes producing modifications in source intensity and transport of gaseous precursors. Sulfate is the major atmospheric sulfur compound. It has mainly a marine biogenic origin, but cataclysmic volcanic eruptions contribute sporadically to the atmospheric sulfur budget through huge SO₂ emissions, ultimately detected in polar ice by H₂SO₄ spikes. Nitrate, the next most important ion determined in polar precipitation, exhibits concentration changes which are presently poorly understood, but which could be linked with the polar ozone hole problem. Finally, continental dust and sea-spray aerosol components are also present in the ice at much higher concentrations during ice ages than during interglacial periods, due to an intensification of their production and long-range transport under glacial climatic conditions. (Auth. mod.)

I-50879

Bromwich, D.H., Du, Y., Parish, T.R., **Numerical simulation of winter katabatic winds from West Antarctica crossing Siple Coast and the Ross Ice Shelf**, *Monthly weather review*, July 1994, 122(7), p.1417-1435, 42 refs.

Twenty-four hour numerical simulations of wintertime surface winds under clear sky conditions over the West Antarctic ice sheet and its vicinity are performed using a hydrostatic three-dimensional primitive equation model. Two initial states are examined: a state of rest, and a prescribed pressure field associated with katabatic winds from West Antarctica propagating across the Ross Ice Shelf. The antarctic katabatic winds are mainly due to the strong radiative cooling of the ice slopes. The West Antarctic terrain is different from that of East Antarctica in two respects: its mean elevation is much lower, and the slope in the interior is steeper than near the margin at Siple Coast. The simulated surface wind regime reveals confluence zones just inland from the coast and divergence zones around the crest of the terrain. The model results suggest that the continuation of katabatic winds beyond coastal confluence zones, which are sustained by cold-air drainage in the interior, has an important impact on airflow over the flat Ross Ice Shelf adjacent to the Transantarctic Mountains. The prescribed pressure disturbance has little impact on the surface winds in the interior but markedly impacts those over and beyond the gently sloping coastal areas. Discussion of the impact of the surface wind on the polynya northwest of the Ross Ice Shelf is also provided. It is shown that the simulated surface-wind regime is consistent with the available (mostly surface) observational data. (Auth. mod.)

I-50915

Haigh, J.D., **Role of stratospheric ozone in modulating the solar radiative forcing of climate**, *Nature*, Aug. 18, 1994, 370(6490), p.544-546, 31 refs.

Presented here are results from a two-dimensional radiative-chemical-transport model which show that the spectral composition of the solar variations and the photochemical production of stratospheric ozone together lead to a highly nonlinear relationship between the extraterrestrial and cross-tropopause solar radiative flux. Because of this relationship, at middle to high latitudes in the winter hemisphere less solar radiation reaches the troposphere during periods of higher solar activity. The consequent change in latitudinal temperature gradient also affects infrared radiative forcing and potential planetary-wave activity. The general mechanism proposed here may explain some features of the observed correlations between solar variability and climate. A set of graphs is included which extend from 85S to 85N and depict changes in solar flux, ozone concentrations, temperatures, and downward radiative fluxes at various pressure levels aloft. (Auth. mod.)

I-50947

Cubasch, U., et al, **Monte Carlo climate change forecasts with a**

global coupled ocean-atmosphere model, *Climate dynamics*, July 1994, 10(1-2), p.1-19, 36 refs.

Four time-dependent greenhouse warming experiments were performed with the same global coupled atmosphere-ocean model, but with each simulation using initial conditions from different “snapshots” of the control run climate. The radiative forcing—the increase in equivalent CO₂ concentrations from 1985-2035 specified in the Intergovernmental Panel on Climate Change scenario A—was identical in all four 50-year integrations. This approach to climate change experiments is called the Monte Carlo technique and is analogous to a similar experimental set-up used in the field of extended range weather forecasting. The results indicate that the time evolution of the global mean warming signal is strongly dependent on the initial state of the climate system. While the individual members of the ensemble show considerable variation in the pattern and amplitude of near-surface temperature change after 50 years, the ensemble mean climate change pattern closely resembles that obtained in a 100-year integration performed with the same model. While the ensemble mean surface temperature and sea level fields show regionally significant responses to greenhouse-gas forcing, it is not possible to identify a significant response in the precipitation and soil moisture fields. Sea ice volume variations in both arctic and antarctic regions were included in the simulations. (Auth. mod.)

I-50949

Moore, A.M., Gordon, H.B., Investigation of climate drift in a coupled atmosphere-ocean-sea ice model, *Climate dynamics*, July 1994, 10(1-2), p.81-95, 33 refs.

Climate drift is a common problem in most state-of-the-art coupled atmosphere-ocean-sea ice models. This paper analyzes the nature of climate drift in such a model, and addresses the question of whether or not climate drift is inherent to the model, or whether the drift can be averted by a suitable choice of initial conditions or coupling procedure. The “synchronous” approach to coupling was adopted in which the ocean, atmosphere and sea ice models were spun-up independently to equilibrium using climatological forcing fields, including examples from both arctic and antarctic regions. The models were then coupled and integrated forward in time. Several experiments were performed which were designed to assess the impact of different coupling methodologies and changes in the initial conditions of the component models on the climate drift of the system. The results indicate that climate drift is a problem inherent to the coupled model, in that systematic errors in the components lead to incompatibilities in the surface fluxes required by the component models to maintain realistic climatologies. Climate drift can be averted only if the parameterizations of certain important physical processes are improved. (Auth. mod.)

I-50950

Medvedev, A.S., Fomichev, V.I., Net radiative heating and diagnostics of the diabatic circulation in the 15-110 km height layer, *Journal of atmospheric and terrestrial physics*, Oct. 1994, 56(12), p.1571-1584, 52 refs.

The vertical and latitudinal structure of both net radiative heating and radiative equilibrium temperature in the 15-110 km height region have been calculated for solstice and equinox conditions extending to both polar regions. The monthly mean climatological fields of temperature and chemical constituents along with an accurate radiative algorithm were used. Solar heating due to O₃, O₂, CO₂ and H₂O and infrared cooling due to data for temperature and the mean zonal wind, the diabatic circulation and eddy zonal accelerations were diagnosed. The interhemispheric transport regime at the solstice is shown to extend into the lower thermosphere, while at equinox the diabatic circulation has a more intricate multi-cell structure. Interhemispheric differences in the diagnosed fields are found in both winter and spring hemispheres. The distributions of eddy accelerations obtained for solstice conditions have two height maxima in the mesosphere and lower thermosphere for each hemisphere. (Auth.)

I-50953

Flower, B.P., Kennett, J.P., Middle Miocene climatic transition: East Antarctic ice sheet development, deep ocean circulation and global carbon cycling, *Palaeogeography, palaeoclimatology, palaeoecology*, Apr. 1994, 108(3/4), p.537-555, Refs. p.552-555.

The middle Miocene represents a major change in state in Cenozoic climatic evolution, following the climax of Neogene warmth in the late early Miocene at ca. 16 Ma. The early stage of this climatic transition from 16 to 14.8 Ma was marked by major short term variations in global climates, East Antarctic Ice Sheet (EAIS) volume, sea level, and deep ocean circulation. In the later stage from 14.8 to 12.9 Ma, climatic developments included major growth of the EAIS and associated antarctic cooling, a distinct increase in the meridional temperature gradient, large fluctuations in sea level followed by a global sea level fall, and important changes in deep water circulation, including increased production of Southern Component Water. East Antarctic Ice Sheet growth and polar cooling also had large effects on global carbon cycling and on the terrestrial biosphere, including aridification of mid-latitude continental regions. Increased stability of the EAIS after 14.8 Ma represents a crucial step in the establishment of late Neogene global climate systems. (Auth. mod.)

I-50960

Bian, L.G., Lu, L.H., Zhang, Y.P., Some characteristics of the surface radiation components at Zhongshan Station, *Antarctic research*, June 1993, 4(1), p.35-41, 12 refs.

A preliminary analysis of some characteristics of radiation components is made by using the surface radiation data obtained from Feb. 1990 to Jan. 1991 at Zhongshan Station. Results show that the fluxes of direct radiation and global radiation are strong with higher atmospheric transparency, and that the surface can absorb large amounts of radiation energy in the warm season. The surface loses heat energy in the cold season due to seasonal variations of surface albedo and shortwave radiation. The variation of net longwave radiation is related to cloud cover and surface air temperature. The property of net radiation is similar to other antarctic coastal stations but differs greatly from the antarctic inland area. (Auth.)

I-51001

Völkening, J., Baumann, H., Heumann, K.G., Atmospheric distribution of particulate lead over the Atlantic Ocean from Europe to Antarctica, *Atmospheric environment*, 1988, 22(6), p.1169-1174, 29 refs.

Concentrations of lead in aerosols over the Atlantic Ocean were measured between 50N and 70S during different expedition legs of the German polar research ship FS *Polarstern* in 1984 and 1985. The Pb concentrations varied from 0.008 to 66 ng/m³. High Pb concentrations were found near regions with high industrial activities. The highest values were detected near the west coast of Europe and in some coastal regions of South America. Measurements where Fe beside Pb was determined as a crustal element show in their Pb/Fe ratio that anthropogenic and other non-crustal sources significantly influence the atmospheric lead concentration south of Dakar and over South America. The measured Pb/Fe ratios over the ocean between both continents are much lower, but still higher than the crustal Pb/Fe ratio. Very low Pb concentrations in the range of 0.1-3 ng/m³ were measured between the African and South American continents near the equator and around the South Shetland Is. near the Antarctic Peninsula. The lowest Pb concentrations of 8-25 pg/m³ were found in aerosols over the Ekström Ice Shelf near the ice edge. The present study has resulted in one of the most extensive global distribution patterns of this important trace element to date. In addition, the analysis by isotope dilution mass spectrometry guarantees accurate results down to an atmospheric level of a few pg Pb/m³ if contamination is under control. (Auth. mod.)

I-51037

Frouin, R., Panouse, M., Devaux, J.C., Sunphotometer measurements of aerosol optical thickness in the Gerlache Strait and Marguerite Bay, Antarctica, *Antarctic journal of the United States*, 1992, 27(5), p.193-194, 4 refs.

During the 1991-1992 RACER cruise, aerosol optical thickness measurements were made using a three-channel sunphotometer. The objective was to verify aircraft estimates of aerosol optical thickness obtained with the Polarization and Directionality of the Earth Reflectance (POLDER) instrument, which measured the intensity of reflected sunlight at 3,962-4,572 m altitudes over the RACER study sites.

I-51039

Deuzé, J.L., et al, Retrieval of aerosols over the Gerlache Strait from aircraft photopolarimetric observations, *Antarctic jour-*

nal of the United States, 1992, 27(5), p.197-199, 4 refs.

Photopolarimetric measurements made with the Polarization and Directionality of the Earth's Reflectance (POLDER) instrument during the 1991-1992 RACER campaign have been analyzed to determine the aerosol conditions prevailing over the Gerlache Strait on Dec. 29, 1991. In this preliminary study, the results obtained with only one POLDER scene are reported. The main objective was not precisely to retrieve the aerosols (amount and type), but rather to provide evidence for their presence and to qualitatively fit the measurements, using an aerosol model, inferred by examining the total reflectance and polarization ratio at 850 nanometers as well as the spectral change in the total reflectance.

I-51045

Marti, J.J., Mauersberger, K., **Evidence for nitric acid pentahydrate formed under stratospheric conditions**, *Journal of physical chemistry*, July 14, 1994, 98(28), p.6897-6899, 15 refs.

Type I polar stratospheric clouds (PSC I) play an important role in ozone depletion reactions, and their composition may determine a key step in the heterogeneous chemistry. Formation of PSC I has been simulated by vapor depositing nitric acid and water on different substrates under conditions designed to approach those found in the polar stratosphere. Composition measurements of the resulting solids suggest the existence of a previously unreported hydrate of nitric acid, the pentahydrate. When PSC I particles condense from the vapor phase, the pentahydrate may be the nitric acid solid whose formation is favored under stratospheric temperature and pressure conditions. (Auth. mod.)

I-51073

Yagüe, C., Cano, J.L., **Influence of stratification on heat and momentum turbulent transfer in Antarctica**, *Boundary-layer meteorology*, Apr. 1994, 69(1-2), p.123-136, 23 refs.

Data from the antarctic winter at Halley Base have been used in order to evaluate qualitatively and quantitatively how the stratification in the lower atmosphere (evaluated with the gradient Richardson number, Ri) influences the eddy transfers of heat and momentum. Vertical profiles of wind and temperature up to 32 m, and turbulent fluxes measured from three ultrasonic thermo-anemometers installed at 5, 17 and 32 m, are employed to calculate Ri , the friction velocity (u^*) and the eddy diffusivities for heat (K_h) and momentum (K_m). The results show a substantial dependence of stability on K_m , K_h and u^* , with a sharp decrease in these turbulent parameters with increasing stability. The ratio of eddy diffusivities (K_h/K_m) is also analyzed and exhibits a decreasing tendency as Ri increases, reaching values even less than 1, i.e., there were situations where the turbulent transfer of momentum was greater than that of heat. Possible mechanisms of turbulent mixing are discussed. (Auth. mod.)

I-51091

Radionov, V.F., **Variability of aerosol extinction of solar radiation in Antarctica**, *Antarctic science*, Sep. 1994, 6(3), p.419-424, 18 refs.

Temporal variations of the aerosol optical depth and transmission coefficient of the atmosphere are considered, using data from Mirnyy. Year-to-year variability of these parameters is determined mainly from stratospheric aerosol pollution due to volcanic activity. A considerable increase of atmospheric turbidity has been observed since the end of Sep. 1991. This phenomenon seems to be associated with the Mount Pinatubo volcanic eruption. (Auth.)

I-51100

Rees, J.M., Rottman, J.W., **Analysis of solitary disturbances over an antarctic ice shelf**, *Boundary-layer meteorology*, May 1994, 69(3), p.285-310, 24 refs.

Large amplitude, propagating, solitary disturbances have been observed in the atmospheric boundary layer over a gently sloping antarctic ice shelf. The waves are usually trapped within the lowest 40 m and are observed only when the surface layer is strongly and stably stratified and prevailing wind speeds are low. It is shown that the waves are trapped due to the combined effects of velocity curvature and stratification. The observed wavelengths can be bounded using simple heuristic arguments based on the Scorer parameter. Properties of the waves are compared with results from the weakly nonlinear numerical model of Rottman and Einaudi (1993). (Auth. mod.)

I-51102

Rosenfield, J.E., Newman, P.A., Schoeberl, M.R., **Computations of diabatic descent in the stratospheric polar vortex**, *Journal of geophysical research*, Aug. 20, 1994, 99(D8), p.16,677-16,689, 39 refs.

A radiation model, together with National Meteorological Center temperature observations, was used to compute daily net heating rates in the Northern Hemisphere (NH) for the arctic late fall and winter periods of both 1988-1989 and 1991-1992 and in the Southern Hemisphere (SH) for the antarctic fall and winters of 1987 and 1992. The heating rates were interpolated to potential temperature surfaces between 400 K and 2000 K and averaged within the polar vortex, the boundary of which was determined by the maximum gradient in potential vorticity. The averaged heating rates were used in a one-dimensional vortex interior descent model to compute the change in potential temperature with time of air parcels initialized at various potential temperature values, as well as to compute the descent in log pressure coordinates. In the NH vortex, air parcels which were initialized at 18 km on Nov. 1 descended about 6 km by Mar. 21, while air initially at 25 km descended 9 km in the same time period. In the SH vortex, parcels initialized at 18 km on Mar. 1 descended 3 km, while air at 25 km descended 5-7 km by the end of Oct. In both the NH and the SH, computed descent rates increased markedly with height. The descent for the NH winter of 1992-1993 and the SH winter of 1992, computed with a three-dimensional trajectory model using the same radiation code, was within 1 to 2 km of that calculated by the one-dimensional model, thus validating the vortex averaging procedure. The computed descent rates generally agree well with observations of long-lived tracers, thus validating the radiative transfer model. (Auth. mod.)

I-51103

Luo, M., Cicerone, R.J., Russell, J.M., III, Huang, T.Y.W., **Observations of stratospheric hydrogen fluoride by Halogen Occultation Experiment (HALOE)**, *Journal of geophysical research*, Aug. 20, 1994, 99(D8), p.16,691-16,705, 40 refs.

The Halogen Occultation Experiment (HALOE) Hydrogen Fluoride (HF) channel on the Upper Atmospheric Research Satellite is providing the first global measurements of stratospheric HF, the dominant fluorine reservoir in the atmosphere. This paper describes the latitudinal and seasonal variations of HALOE-observed HF in terms of vertical profiles, altitude/latitude cross sections, and column abundances. The HF global distribution shows a "tracerlike" structure and its column amount increases with latitude, in agreement with previous aircraft measurements of the HF column amount. HALOE HF measurements during the 1993 antarctic spring are briefly described. This species behaves like a conserved tracer and its distribution shows an area of enhanced mixing ratios correlated with a polar vortex that has a clear latitude boundary. Finally, simulated HF distributions by the National Center for Atmospheric Research two-dimensional model are used to compare with HALOE observations of HF. Reasonable agreements in the global structure and the absolute amount of HF are found. The differences between the model and the observed results indicate the need for improving treatment of atmospheric dynamics and fluorine-related chemical parameters in the model simulations. (Auth. mod.)

I-51104

Ciais, P., Jouzel, J., **Deuterium and oxygen 18 in precipitation: isotopic model, including mixed cloud processes**, *Journal of geophysical research*, Aug. 20, 1994, 99(D8), p.16,793-16,803, 34 refs.

Modeling the isotopic ratios of precipitation in cold regions meets the problem of "switching" from the vapor-liquid transition to the vapor-ice transition at the onset of snow formation. The one-dimensional model (mixed cloud isotopic model, MCIM) described in this paper focuses on the fractionation of water isotopes in mixed clouds, where both liquid droplets and ice crystals can coexist for a given range of temperatures. This feature is linked to the existence of specific saturation conditions within the cloud, allowing droplets to evaporate while the water vapor condenses onto ice crystals. The isotopic composition of the different airborne phases and the precipitation is calculated throughout the condensation history of an isolated air mass moving over the antarctic ice sheet. The results of the MCIM are compared to surface snow data both for the isotopic ratios and the deuterium excesses. The sensitivity of the model is compared to previous one-dimensional models. Thus, accounting specifi-

cally for the microphysics of mixed stratiform clouds (Bergeron-Findeisen process) does not invalidate the results of earlier modeling studies. (Auth. mod.)

I-51105

Chen, P., Holton, J.R., O'Neill, A., Swinbank, R., **Quasi-horizontal transport and mixing in the antarctic stratosphere**, *Journal of geophysical research*, Aug. 20, 1994, 99(D8), p.16,851-16,866, 27 refs.

The quasi-horizontal transport and mixing properties of the antarctic stratosphere are investigated with a semi-Lagrangian transport model and a "contour advection" technique for the winter and spring of 1992, using analyzed winds from the United Kingdom Meteorological Office data assimilation system. Transport calculations show that passive tracers are well mixed inside the polar vortex as well as in the mid-latitude "surf zone." At the vortex edge, strong radial gradients in the tracer fields are well preserved, and their evolutions follow that of the potential vorticity until some time after the breakdown of the polar vortex. In the middle stratosphere there is little tracer exchange across the vortex edge in Aug. and Sep. Some vortex air is eroded into the surf zone in filamentary form in Oct., and very strong exchange of air occurs between high and middle latitudes in Nov. In the lower stratosphere the vortex is not so isolated from the mid-latitudes as in the middle stratosphere, and there is more mass exchange across the vortex edge. Calculations of the lengthening of material contours using the contour advection technique show that in the middle stratosphere, strong stirring (i.e., stretching and folding of material elements) occurs in the inner vortex, with the strongest occurring in the mid-latitude surf zone and the weakest occurring at the vortex edge. In the lower stratosphere, strong stirring occurs in the inner vortex. Stirring is moderate at the vortex edge and in the mid-latitudes. (Auth. mod.)

I-51106

Lowe, D.C., et al, **Concentration and ^{13}C records of atmospheric methane in New Zealand and Antarctica: evidence for changes in methane sources**, *Journal of geophysical research*, Aug. 20, 1994, 99(D8), p.16,913-16,925, 55 refs.

Measurements of ^{13}C in atmospheric methane made at Baring Head, New Zealand over the period 1989-1993 display a persistent but highly variable seasonal cycle. Values for $\delta^{13}\text{C}$ peak in summer at about -46.9 per mill and drop to around -47.5 per mill in the late winter. Methane concentration shows a similar cycle, with winter peaks and summer minima. Similar features are observed at the New Zealand antarctic station, Scott Base. While the phase of the $\delta^{13}\text{C}$ cycle is consistent with a kinetic isotope effect that preferentially leaves methane enriched in ^{13}C in the atmosphere after oxidation by OH, the amplitude of the cycle is much larger than expected from published laboratory measurements of the effect. The trend in ^{13}C since mid-1991 coincided with significant changes to the methane growth rate observed at Baring Head and Scott Base: an elevated growth rate of about 15 parts per billion by volume (ppbv) during 1991 gave way to less than 3 ppbv/yr thereafter. A 2-box model of atmospheric methane (one box per hemispheric reservoir) suggests that (1) the recent decline in ^{13}C in methane observed at Baring Head and Scott Base cannot have a solely northern hemispheric origin, and (2) the most plausible origin is a recent reduction in methane released by biomass burning in the Southern Hemisphere, combined with a lower release rate of fossil methane in the Northern Hemisphere. (Auth. mod.)

I-51109

Stark, P., **Climatic warming in the central Antarctic Peninsula area**, *Weather*, June 1994, 49(6), p.215-220, 7 refs.

An analysis of the 44-year continuous temperature record from Faraday shows a statistically significant warming trend over this period of almost 2.7 C. Decadal analysis of the data has shown that the greatest warming is in the autumn and winter months, with values up to 5 C. This is probably caused by variations in the amount of sea-ice cover and associated weather, the results of which can be seen in the data for the month that is usually the coldest. In the summer and early autumn, when the sea-ice is at a minimum, these continental influences are reduced and the statistical significance of the temperature trend is very high. It is likely that the Antarctic Peninsula plays an important part in reducing the continental influences on the climate; stations further to the north are affected by weather and ice conditions associated with the Weddell Sea. The analysis of data from Signy shows no statistically significant trends. Data from stations in

the Marguerite Bay area show warming trends of a similar magnitude to those observed at Faraday, although the statistical significance of these trends is considerably lower, probably due to the broken data record. The trend seen is much greater than that observed in global or Southern Hemisphere temperatures over the same period. It suggests that this is an area of high climatic sensitivity. Climate models also suggest that the marginal sea-ice zone is a region where there may be a large response to a general global warming. (Auth. mod.)

I-51119

Juckes, M.N., James, I.N., Blackburn, M., **Influence of Antarctica on the momentum budget of the southern extratropics**, *Royal Meteorological Society. Quarterly journal A*, July 1994, 120(518), p.1017-1044, 51 refs.

The antarctic plateau acts as a strong heat sink for the global climate, cooling the atmosphere and radiating energy to space. A cold dense atmospheric boundary layer is formed. Strong surface winds are formed as the boundary layer drains off the plateau. These drainage winds and the eddy fluxes necessary to maintain them are analyzed in a general circulation model (GCM). The drainage flow is well represented in the GCM. The associated mean meridional circulation is analyzed in isentropic coordinates. The momentum budget over Antarctica reveals a balance between the Eliassen-Palm flux convergence and the Coriolis torque exerted by the mean meridional mass flux. Both vertical and horizontal components of the Eliassen-Palm flux contribute, the vertical component being the greater. (Auth.)

I-51125

Graham, J.D., Roberts, J.T., **Interaction of hydrogen chloride with an ultrathin ice film: observation of adsorbed and absorbed states**, *Journal of physical chemistry*, June 9, 1994, 98(23), p.5974-5983, 38 refs.

To gain insight into how heterogeneous reactions occur in the antarctic stratosphere, adsorption and reaction of simple molecules on model polar stratospheric cloud surfaces were studied. In this work, the temperature-programmed desorption of hydrogen chloride from ultrathin (5-20 monolayers thick) water films is described. Two distinct HCl desorption states, designated *alpha*- and B-HCl, are observed at 140 and 180 K, respectively. Water sublimation occurs at 180 K and is concurrent with B-HCl evolution. B-HCl, which is formed exclusively at low HCl exposures, is derived from the thin film bulk, while *alpha*-HCl is associated with an adsorbed state. B-HCl is assigned to the sublimation of a stoichiometric phase of HCl and water, probably $\text{HCl}\cdot 6\text{H}_2\text{O}$, and *alpha*-HCl is assigned to the thermal desorption of HCl from the hexahydrate surface. Desorption spectra of HCl from ice- d_2 show that H-D exchange between HCl and D_2O is much less than would be expected for a dissociatively adsorbed state of HCl. The *alpha* state is therefore assigned to molecularly adsorbed HCl. The activation energy for *alpha*-HCl desorption is 33 ± 5 kJ/mol, a value which is highly suggestive of formation of a hydrogen bond between HCl and the hexahydrate surface. Two possible structures of HCl adsorbed on the hexahydrate surface are considered. Implications of these results for heterogeneous polar stratospheric chemistry are discussed. (Auth. mod.)

I-51137

Amos, A.F., **AMLR program: A comparison between the summer meteorological conditions at Seal Island and those over the adjacent waters of the Drake Passage**, *Antarctic journal of the United States*, 1992, 27(5), p.230-233, 8 refs.

The Seal Is. are the site of an annual study of seals and penguins by the AMLR program. The waters of the adjacent continental shelf and the Drake Passage are the primary study area of the AMLR program's field work aboard the NOAA ship *Surveyor*. Continuous measurements of winds, air temperature, humidity, pressure, solar radiation parameters, sea temperature, salinity, beam transmission, and chlorophyll fluorescence were made while the ship was under way. A Coastal Climate automatic weather station was installed on Seal I. and operated from mid-Dec. 1991 to mid-Mar. 1992. Weather data were of interest for the seal and penguin studies and also provided a comparison between a stationary "island" station and *Surveyor's* traveling "oceanic" station. The author compares the Feb. 1992 weather data from Seal I. with those from the AMLR underway system and also with the data collected by *Surveyor's* deck watch. These data have not yet been fully corrected.

I-51151

Khalil, M.A.K., Rasmussen, R.A., **Trace gases over Antarctica: Bromine, chlorine, and organic compounds involved in global change**, *Antarctic journal of the United States*, 1992, 27(5), p.267-269, 2 refs.

The seasonal averaged concentrations of 13 trace gases at Palmer and Amundsen-Scott stations are presented in a table. The average differences of the trace gas concentrations at the two sites were calculated by two methods; the difference and percent difference of concentrations for each month are shown in graphs. Among the gases reported, carbon monoxide, methane, hydrogen, and methyl chloroform have substantial seasonal variations at the two sites. The trends for all gases appear to be the same.

I-51152

Swanson, T.H., et al, **Decline in the accumulation rates of atmospheric chlorofluorocarbons 11 and 12 at the South Pole**, *Antarctic journal of the United States*, 1992, 27(5), p.269-271, 14 refs.

Scientists from the Climate Monitoring and Diagnostic Laboratory (CMDL) in the National Oceanic and Atmospheric Administration (NOAA) have been measuring the atmospheric mixing ratios for CFCs and nitrous oxide at the Clean-Air Facility (CAF) at Amundsen-Scott Station since 1977. The most significant trend observed in data from Amundsen-Scott and other remote sites throughout the world has been the growth of the mixing ratios of CFCs in the troposphere. However, recent data from the monitoring station at South Pole and from other sites have shown a significant decrease of the accumulation rates of CFC-11 and CFC-12 during the last 2 years.

I-51153

Zreda-Gostynska, G., Kyle, P.R., **Halogen and sulfur content of volcanic emissions from Mount Erebus, Ross Island, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.271-273, 20 refs.

The purpose of this work was the characterization of the composition of volcanic gases emitted from Mount Erebus. The authors examined three components (sulfur, chlorine, and fluorine) in the gas. These components are also the most abundant species in the samples collected. The authors suggest that Erebus may be a source of the "excess" inorganic chlorine found in the snow on the antarctic plateau. There is a rapid poleward transport of tropospheric air masses during the antarctic summer months; the chlorine in the Erebus plume could thus be transported inland and deposited in the snow.

I-51154

Deshler, T., Adriani, A., **Volcanic aerosol and ozone depletion within the antarctic polar vortex during the austral spring of 1991**, *Antarctic journal of the United States*, 1992, 27(5), p.274-275, 6 refs.

Fresh volcanic layers are the primary source for high concentrations of new aerosols, but these high concentrations last only a short time because of coagulation. For the volcanic aerosols in Antarctica these observations of homogeneous nucleation, along with the altitude of the observations, helped to identify the source of the volcanic aerosols as Cerro Hudson. During each antarctic spring since 1986, approximately 40 ozone profiles have been measured at McMurdo. The results of these measurements have been quite consistent, indicating that during years of severe ozone depletion—1987, 1989, 1990, 1991—approximately half the total column of ozone is lost with more than 80% of the loss occurring between 12 and 20 km. It is suggested that the measurements presented here are the first direct *in situ* measurements confirming that volcanic aerosols can play a part in ozone destruction.

I-51155

Lubin, D., Gautier, C., **Fourier Transform Infrared spectroradiometer measurements of atmospheric longwave emission over Palmer Station, spring 1991**, *Antarctic journal of the United States*, 1992, 27(5), p.276-278, 11 refs.

To better understand the atmospheric radiation budget over the Antarctic Peninsula and the southern ocean, the authors deployed a Fourier Transform Infrared (FTIR) spectroradiometer at Palmer Station during

austral spring, 1991. They were able to operate the spectroradiometer without interruption from Aug. 25 to Nov. 17, 1991, and measurements were made four to five times daily; this data set defines the long wave radiation environment of the region.

I-51156

Murcray, F.J., Heuberger, R., **Extended observations of atmospheric infrared absorption and emission**, *Antarctic journal of the United States*, 1992, 27(5), p.278-279, 4 refs.

A table shows values for water vapor in vertical column amounts and precipitable water contents at the Amundsen-Scott Station for 1989-1990. The figure shows the water and nitric acid lines both measured and calculated for five dates from Dec. 6, 1989 through Sep. 7, 1990. The value of 2×10^{16} molecules per sq.cm. for nitric acid is typical for Amundsen-Scott Station during the austral summer.

I-51157

Rosen, J.M., Kjome, N.T., Oltmans, S.J., **Simultaneous ozone and polar stratospheric cloud observations at Amundsen-Scott South Pole Station during winter and spring 1991**, *Antarctic journal of the United States*, 1992, 27(5), p.279-280, 3 refs.

The authors conducted a series of simultaneous polar stratospheric cloud (PSC) and ozone observations from balloon-borne sensors launched at the Amundsen-Scott Station, continuing until the initial formation of the ozone hole. These observations were augmented with frost-point soundings and additional ozone soundings. A figure shows the results of a sounding made more than one month after the beginning of extensive PSC activity. The frost-point profile illustrated in this figure was obtained on Jan. 12, 1991, and represents initial conditions in the vortex. According to the figure, by July 16 the stratospheric air temperature had cooled well below the initial frost-point and a large fraction of the water vapor would have already condensed. However, in the altitude range of 20 to 45 millibars the backscatter signal is relatively small and does not indicate the presence of significant condensed material. This suggests that the particles have already fallen out, resulting in dehydration of the stratosphere.

I-51185

Mobbs, S.D., ed, King, J.C., ed, **Waves and turbulence in stably stratified flows**, *The Institute of Mathematics and its Applications Conference Series. New series*, 1993, No.40, 465p., Refs. passim. For individual papers see I-51186 through I-51191.

DLC QC157.W393

This volume contains the majority of the papers presented at the IMA conference on Waves and Turbulence in Stably Stratified Flows, held at the University of Leeds in Dec. 1989. The conference, co-sponsored by the Royal Meteorological Society, was the third in a series covering the dynamics of stably-stratified flows. It is suggested that the atmospheric boundary layer in the Antarctic provides an ideal natural laboratory for studying stably-stratified flows, providing the impetus for major field studies such as the French-U.S. IAGO program and STABLE, run by the British Antarctic Survey. Such investigations can make a contribution to the study of stably-stratified flows which extends well beyond the confines of antarctic meteorology. Of the twenty papers included in this volume, six report investigations relating to antarctic field studies.

I-51186

Kottmeier, C., Wachs, P., Sannemann, K., **Coastal antarctic PBL flows under varying external influences**, *The Institute of Mathematics and its Applications Conference Series. New series*, 1993, No.40, Waves and turbulence in stably stratified flows. Edited by S.D. Mobbs and J.C. King, p.61-89, Refs. p.82-84.

DLC QC157.W393

The antarctic planetary boundary layer structure at most locations along the coast varies due to synoptic scale influences. These changes generally happen on a synoptic time scale of a few days. The controlling effects for wind speed and direction near the surface are shown to be the pressure gradients of the synoptic system and the thermal winds, which arise from the temperature contrasts between the continental and marine air masses. Topographic control on the flow is exerted by additional regional scale pressure gradients, originating from momentum imbalances

close to mountainous coasts. An entrainment equation for stably stratified boundary layers in mid- and high latitudes is derived and applied. (Auth. mod.)

I-51187

André, J.C., Pettré, P., Wendler, G., Zephoris, M., **Vertical structure and downslope evolution of antarctic katabatic flows**, *The Institute of Mathematics and its Applications Conference Series. New series*, 1993, No.40, Waves and turbulence in stably stratified flows. Edited by S.D. Mobbs and J.C. King, p.91-104, 4 refs.

DLC QC157.W393

Results from a cooperative field program which took place in Adélie Coast during Nov. and Dec. 1985 are used to describe the vertical structure of strong katabatic winds and its downslope evolution. It is shown that the katabatic layer is separated from the free flow by a neutral or even sometime unstable layer, which thickens progressively along the slope. The mean values of many parameters and the balance of several quantities of specific interest to the katabatic flows, are given, computed in the case of 4 strong katabatic events. The interaction between the stably-stratified katabatic layer and the overlying turbulent interfacial layer is shown to be crucial for explaining the occurrence of sudden events, i.e. the so-called Loewe's phenomena or hydraulic-jump-type of transition between upstream shooting and downstream tranquil flow. One such example of sudden transition is described from experimental vertical soundings taken before and after. Theoretical arguments are given to provide a framework for the interpretation of the observed katabatic flows. (Auth.)

I-51188

King, J.C., **Contrasts between the antarctic stable boundary layer and the mid-latitude nocturnal boundary layer**, *The Institute of Mathematics and its Applications Conference Series. New series*, 1993, No.40, Waves and turbulence in stably stratified flows. Edited by S.D. Mobbs and J.C. King, p.105-120, Refs. p.118-120.

DLC QC157.W393

The Antarctic would appear to offer an ideal "natural laboratory" for studying stable boundary layer phenomena. During the polar night, surface inversions become very strong and there are no complicating effects of diurnal variation. Furthermore, ice caps and ice shelves provide near-ideal uniform and unobstructed sites for micrometeorological measurements. In order to exploit these conditions, the British Antarctic Survey conducted a program of boundary-layer measurements at Halley Station during the 1986 austral winter. In this paper, the results of these experiments are summarized and compared with the current knowledge of the mid-latitude nocturnal boundary layer. The comparison suggests that the antarctic stable boundary layer differs from its mid-latitude counterpart as a result of significant stable stratification of the lower troposphere, slope-induced baroclinicity and internal gravity wave effects. (Auth.)

I-51189

Culf, A.D., **Acoustic sounder observations of low level jets at Halley, Antarctica**, *The Institute of Mathematics and its Applications Conference Series. New series*, 1993, No.40, Waves and turbulence in stably stratified flows. Edited by S.D. Mobbs and J.C. King, p.121-138, 13 refs.

DLC QC157.W393

The signature of low level jets on acoustic sounder facsimile charts is discussed, and examples of such echoes on records from Halley Station are presented. The results from a one-dimensional numerical model show that a jet structure to easterly winds at Halley is consistent with the terrain slope there. The height of the wind maximum obtained from the acoustic sounder records is compared with smoothed wind profiles obtained from radiosonde ascents and with wind profiles obtained from the numerical model. (Auth.)

I-51190

Culf, A.D., McIlveen, J.F.R., **Acoustic observation of the peripheral antarctic boundary layer**, *The Institute of Mathematics and its Applications Conference Series. New series*, 1993, No.40, Waves and turbulence in stably stratified flows. Edited by S.D. Mobbs and J.C. King, p.139-154, 10 refs.

DLC QC157.W393

Atmospheric acoustic sounding (Sodar) is outlined, together with the information it can provide about the atmospheric boundary layer. Echo patterns from Halley Station are discussed and related to simultaneous direct measurements for cases showing turbulent structure in a ground-based shear layer, the same in a deep, slightly stable layer, gravity and shear waves, and a gravity current. (Auth.)

I-51191

Rees, J.M., Mobbs, S.D., **Large eddies in the stably stratified atmospheric boundary layer**, *The Institute of Mathematics and its Applications Conference Series. New series*, 1993, No.40, Waves and turbulence in stably stratified flows. Edited by S.D. Mobbs and J.C. King, p.155-184, 19 refs.

DLC QC157.W393

During the polar winter, the stable boundary layer does not develop from a convective daytime boundary layer and hence the weak stratification aloft is usually absent. In this paper, two numerical simulations of the polar winter boundary layer are presented. In one simulation, strong surface cooling is applied throughout in order to maintain a highly stratified surface layer. For the other case, although the surface layer is initially stratified, surface cooling is not applied and the boundary layer becomes eroded. These two situations are compared, paying particular attention to the relative roles of the large eddies generated by shear instability and the parameterized sub-grid scale turbulence. The spectra of the resolved eddies are examined. (Auth. mod.)

I-51194

Khalil, M.A.K., Rasmussen, R.A., **Global decrease in atmospheric carbon monoxide concentration**, *Nature*, Aug. 25, 1994, 370(6491), p.639-641, 16 refs.

A brief review is given of the kinds and distributions of CO and other chemical agents in the global atmosphere along with the sources and trends of these pollutants. The continuation of the study for the period 1988 through 1992 presented in this paper shows a rapid decline at a rate of about 2.6%/yr. An especially rapid decrease in the Southern Hemisphere is attributed to a reduction in tropical biomass burning. Data from Amundsen-Scott Station is included.

I-51219

Italy. Consiglio Nazionale delle Ricerche. Direzione Centrale Attività Scientifiche. Commissione Scientifica Polare, **Role of remote areas in the study of global changes. Seminar proceedings** [Atti del Seminario su "Il ruolo delle aree remote nello studio dei cambiamenti globali"], Rome, 1993, 154p., In Italian with English summaries. Refs. passim. For individual papers see B-51222, B-51223, F-51220, I-51221, I-51224 and I-51225.

This is a collection of papers presented at a seminar on the role of remote areas in the study of global changes seen from a climatological point of interest. Six of the papers are pertinent to Antarctica, including investigations of different cryospheric sectors, meteorological factors, vertebrate adaptation to low temperatures, and oceanographic and limnological studies carried out at Terra Nova Bay Station.

I-51221

Corazza, E., Tesi, G., **Tropospheric hydrogen and carbon monoxide in Antarctica and Greenland** [Idrogeno e ossido di carbonio troposferici in Antartide e Groenlandia], Italy. Consiglio Nazionale delle Ricerche. Direzione Centrale Attività Scientifiche. Commissione Scientifica Polare. Atti del Seminario su "Il ruolo delle aree remote nello studio dei cambiamenti globali" (Role of remote areas in the study of global changes. Seminar proceedings), Rome, 1993, p.77-85, In Italian with English summary. 12 refs.

Tropospheric trace component concentrations for H₂, CO, and CO₂ were determined by gas chromatography at Terra Nova Bay Station during 1990 and 1991. Similar measurements were carried out in central Greenland in 1991 and 1992. In both areas some small differences were found between two subsequent seasons; the greatest differences, however, were found in Antarctica within the same season, depending on the origin of the air masses. (Auth. mod.)

I-51224

Lenaz, R., **Oceanographic investigations and global change models** [Contributo delle ricerche in aree oceaniche allo studio dei cambiamenti globali], Italy. Consiglio Nazionale delle Ricerche. Direzione Centrale Attività Scientifiche. Commissione Scientifica Polare. Atti del Seminario su "Il ruolo delle aree remote nello studio dei cambiamenti globali" (Role of remote areas in the study of global changes. Seminar proceedings), Rome, 1993, p.129-132, In Italian with English summary. 6 refs.

Numerical models developed in the 80s demonstrated that climatic changes are amplified in remote areas such as the polar regions. Later on, simulations based on a coupled ocean model showed that such amplifications are weaker than previously assumed. Hence the need exists to verify these models by means of direct measurements performed not only in polar regions, but also in surrounding oceanic areas. This is also necessary in order to verify the extension of the phenomena observed at the poles, such as ozone depletion in Antarctica and its likely extension to intermediate latitudes. An example of the feasibility of continuous measurements was offered by the latest Italian 1990-91 expedition on board R/V OGS *Explora*, where meteorological data recording trace gases concentration measurements and atmospheric particulate sampling were performed. (Auth. mod.)

I-51225

Libera, V., **Limnological and meteorological investigations of fresh-water lakes near the Terra Nova Bay Station** [Osservazioni fisico-limnologiche su un lago antartico nell'ambito di una ricognizione dei corpi d'acqua dolce nell'area di Baia Terra Nova], Italy. Consiglio Nazionale delle Ricerche. Direzione Centrale Attività Scientifiche. Commissione Scientifica Polare. Atti del Seminario su "Il ruolo delle aree remote nello studio dei cambiamenti globali" (Role of remote areas in the study of global changes. Seminar proceedings), Rome, 1993, p.133-139, In Italian with English summary. 7 refs.

Physical and limnological data from an antarctic lake situated in the Terra Nova Bay area are reported and discussed. The data, which are part of a survey of freshwater bodies in the area, were recorded by an hydrometeorological station and indicate annual trends of air temperature and humidity, wind speed, solar radiation, lake level, water temperature, Ph and conductivity. (Auth.)

I-51249

Gancedo, J.R., et al, **Corrosion reaction of iron exposed to the open atmosphere in the Antarctic**, *Hyperfine interactions*, Feb. 1994, 83(1-4), p.363-366, 8 refs.

Within a cooperative program for the elaboration of a Latin American Map of Atmospheric Corrosion, weathering steel and mild steel samples were exposed to the antarctic atmosphere and the corrosion products analyzed by ICEMS, XPS and XRD. Superparamagnetic α -FeOOH was the main corrosion product after 24 h of exposure. Cl⁻ ions are found on the surface of the corroded samples by XPS. (Auth.)

I-51281

Taalas, P., **Factors affecting the behaviour of tropospheric and stratospheric ozone in the European Arctic and in Antarctica**, *Finnish Meteorological Institute. Contributions*, 1993, No.10, 31p., 9 refs.

Three papers dealing with new ozone observations made in the European Arctic and at the Antarctic Peninsula since 1987 are reviewed here. An update including the year 1992 is also made. Total ozone and ozone sounding observations made in the European Arctic and in Antarctica in 1987-92 and meteorological sounding observations made at Sodankylä, Finland in 1965-92 have been studied. No regular ozone soundings had been performed in the European Arctic and on the Antarctic Peninsula prior to 1988. Ozone observations have been interpreted using global analysis fields from the European Centre for Medium Range Weather Forecasts. These allow one to calculate potential vorticity maps and three-dimensional trajectories. The use of such tools in ozone research is a recent development. Pronounced stratospheric ozone loss has been observed in Antarctica in springtime; no similar loss has been observed in the European Arctic, although large negative anomalies of short duration

have been detected. It has been discovered that meteorological factors, i.e. subtropical advection of ozone-poor air towards the poles and rising motion in the lower stratosphere, lead to low total ozone columns over Europe. Interhemispheric comparison of the behavior of tropospheric ozone at high latitudes has revealed that the spring peak of tropospheric ozone in the Northern Hemisphere is most probably caused by general photochemical activation of nitric and hydrocarbon compounds. (Auth. mod.)

I-51287

Kerr, R.A., **Antarctic ozone hole fails to recover**, *Science*, Oct. 14, 1994, 266(5183), p.217.

With most of the Pinatubo debris dispersed, the size of the ozone hole over Antarctica was expected to diminish considerably. However, the hole continues nearly as wide and deep as ever, and the hole watchers are puzzled as to why. Three factors are suggested as possible reasons for the continued near-record severity: a colder than usual stratosphere; lingering debris from the Pinatubo explosion; and the still increasing amounts of chlorine and bromine in the stratosphere. If the third factor is in fact the primary reason for the non-recovery of the ozone hole, it may mean several more years before the destruction hits bottom because the amount of these chemicals entering the atmosphere continues to increase at a rate of about 2%/year.

I-51300

Können, G.P., Muller, S.H., Tinbergen, J., **Halo polarization profiles and the interfacial angles of ice crystals**, *Applied optics*, July 20, 1994, 33(21), p.4569-4579, 19 refs.

Polarization and radiance of various types of refraction halo in ice-crystal swarms that extend to ground level were measured as a function of scattering angle. Simultaneously, samples of the crystals that produce these halos were collected and replicated. Measurements were conducted at Amundsen-Scott and Vostok Stations. The halo polarization peaks are wider than the Fraunhofer theory of diffraction predicts for the observed size distribution of the replicated crystals. The explanation put forward is that the angles between crystal prism faces are not always exact integer multiples of 60 deg, and the basal faces are not always exactly parallel, as is usually assumed. The collected crystals confirm this. The widths of the halo polarization peaks can be explained if the distributions of the interfacial angles around their means reach their half-maximum values at a deviation of 0.49 deg. This corresponds to a deviation of 0.35 deg of the face normals from their crystallographic positions. The presence of variation in interfacial angles in low-level halos seems to arise from the fact that the crystals are growing. (Auth. mod.)

I-51301

Davison, B.M., Allen, A.G., **Method for sampling dimethylsulfide in polluted and remote marine atmospheres**, *Atmospheric environment*, June 1994, 28(10), p.1721-1729, 29 refs.

Methods have been developed for the measurement of atmospheric dimethylsulfide (DMS) in both polluted and clean marine environments, avoiding sampling losses due to reactions with atmospheric oxidants. Pre-concentration of DMS on Molecular Sieve 5A was followed by analysis using gas chromatography with flame photometric detection. Prolonged contact of polluted air samples with a potassium iodide-based solution resulted in total oxidant destruction. Dimethylsulfide was measured over the Atlantic Ocean during a cruise between the United Kingdom and the Antarctic between Oct. 1992 and Jan. 1993. In equatorial regions (30N-30S) the atmospheric DMS concentration ranged from 5 to 90 ng/m³ with an average of 30 ng/m³. In polar waters and regions south of the Falkland Is. concentrations from 5 to 1050 ng/m³ were observed with a mean concentration of 120 ng/m³. (Auth. mod.)

I-51368

Ghil, M., **Cryothermodynamics: the chaotic dynamics of paleoclimate**, *Physica D*, Oct. 1, 1994, 77(1-3), p.130-159, 124 refs.

The evidence for irregular climatic change between warm and cold extremes is reviewed, concentrating on the last two million years, the Quaternary. The suspects in generating this irregular evolution of temperature and ice volume are the climatic subsystems, atmosphere, oceans, ice sheets, bedrock and biota. Processes within each subsystem are briefly described, including major feedback mechanisms that characterize their collective behavior. Simple semi-empirical models are formulated and

shown to have irregular behavior with both quasi-periodic and aperiodic components. Antarctic ice core analysis is used to amplify climatic variation hypotheses. (Auth. mod.)

I-51371

Sinclair, M.R., **Objective cyclone climatology for the Southern Hemisphere**, *Monthly weather review*, Oct. 1994, 122(10), p.2239-2256, 37 refs.

An objective method is developed and used to derive a climatology of centers of cyclonic vorticity for the Southern Hemisphere, based on twice-daily European Centre for Medium-Range Weather Forecasts (ECMWF) 1000-hPa analyses during 1980-86. These centers were computed as local minima of geostrophic relative vorticity, extending previous studies based on pressure minima. Large numbers of vorticity centers were found south of 60S and near the mid-latitude continents, as in previous studies. These were a mixture of migratory centers and other fixed topographic features. The maxima around Antarctica may include many spurious centers that are artifacts of a fictitious-surface anticyclone over the elevated continent. Maxima around East Antarctica were located near katabatic-prone stations. Large counts near the three mid-latitude landmasses were mostly heat lows and lee troughs. These stationary orographic features were eliminated to retain just the traveling disturbances that dominate the weather and climate of the region. These mobile centers were distributed much more uniformly. When centers were counted just once per grid square per cyclone, the resulting "track density" maximized year-round in a belt near 50S rather than within the cyclone "graveyard" of the circumpolar trough, in good agreement with baroclinic storm tracks obtained elsewhere from eddy statistics. (Auth. mod.)

I-51373

Stearns, C.R., Weidner, G.A., **Antarctic automatic weather stations: austral summer 1991-1992**, *Antarctic journal of the United States*, 1992, 27(5), p.280-282, 2 refs.

The United States Antarctic Program (USAP) of the National Science Foundation Office of Polar Programs (OPP) places automatic weather stations (AWS) units in remote areas of Antarctica in support of meteorological research and operations. The AWS data are collected by the ARGOS data collection system on board the National Oceanic and Atmospheric Administration (NOAA) series of polar orbiting satellites. The AWS units are located in arrays for meteorological experiments and at other sites for operational purposes. Any one AWS unit may contribute to several experiments, and all contribute to operational purposes especially for preparation of weather forecasts for aircraft flights to and from New Zealand and within Antarctica.

I-51374

Braaten, D.A., Dreschhoff, G.A.M., **Maximum and minimum temperature trends at McMurdo Sound Station**, *Antarctic journal of the United States*, 1992, 27(5), p.282-283, 2 refs.

The authors have obtained copies of daily surface weather observation sheets for McMurdo Station from the National Climatic Data Center. These data span a 35-year period from Mar. 1956 through Oct. 1990. The data obtained lack 16 months during the last 3 years (1988-1990). The monthly mean of the daily maximum and minimum temperatures at McMurdo Station between 1956 and 1990 are shown in figures. The greatest maximum and minimum temperatures occur in Jan., and the lowest maximum and minimum temperatures occur in Aug. The maximum and minimum temperature trends observed at McMurdo Station are the exact opposite of those in regional mid-latitude studies of maximum and minimum temperature climatology between 1950 and 1990 conducted by Karl et al. (1991).

I-51375

Wendler, G., Pook, M., **On the half-yearly pressure oscillation in eastern Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.284-285, 4 refs.

In 1980, automatic weather stations (AWS) reporting via satellite were placed in East Antarctica. A detailed discussion of one specific climatic element-atmospheric pressure is presented. One AWS, No.D10, is located 5 km from the coast and about 10 km from Dumont d'Urville Station, which is situated on an island. The slope is relatively steep (1:20) and snow-covered year round. The atmospheric pressure displays a semian-

nual variation with a main maximum in summer (Jan. and Dec.) and a secondary maximum in mid-winter (June). Data from remotely located automatic weather stations in Antarctica have demonstrated that the semi-annual pressure variation is well established near sea level. However, with increasing latitude the variation becomes weaker and in the interior of Antarctica only a trace remains.

I-51376

Stearns, C.R., Weidner, G.A., **Wind speed, wind direction, and air temperature at Pegasus North during 1991**, *Antarctic journal of the United States*, 1992, 27(5), p.285-287, 3 refs.

Automatic weather stations (AWS) units are installed at the north and south ends of Pegasus blue-ice runway on the Ross Ice Shelf near Ross I., and at Minna Bluff and Linda sites in support of the meteorology of the runway. The purpose of the AWS units is to determine the reason for the blue ice and to learn to forecast the extreme wind speeds observed in the area. Meteorological data at three hourly intervals are used to prepare the results presented here. A table presents the monthly means and extremes of temperature, wind, and the surface sensible and latent heat fluxes for Pegasus North site. Data are available only for the first 10 months of 1991 at the present time.

I-51377

Parish, T.R., **Katabatic wind forcing of tropospheric circumpolar motions about Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.287-289, 5 refs.

Katabatic winds are commonplace features within the lowest few hundred meters of the antarctic troposphere. The radial drainage pattern off the elevated plateau and downslope increase in the magnitude of the katabatic wind imply that subsidence must occur over Antarctica. Thus, a secondary circulation extending throughout the troposphere becomes established in the high southern latitudes. The resulting convergence in the upper troposphere above Antarctica acts to generate cyclonic vorticity; a circumpolar vortex develops with time. A schematic illustration of this meridional circulation is shown. A number of numerical simulations have depicted the sensitivity of the troposphere to the katabatic wind regime. The results of one such numerical experiment are presented here.

I-51378

Carrasco, J.F., Bromwich, D.H., **Mesoscale cyclogenesis over the southeastern Pacific Ocean**, *Antarctic journal of the United States*, 1992, 27(5), p.289-291, 14 refs.

A survey of mesoscale cyclogenesis over the Amundsen and Bellinghausen seas was carried out using all available satellite images for Aug. 1989 to Feb. 1990, collected at Palmer Station. A figure shows the initial location and trajectories of the mesoscale vortices during the study period. Although the results indicate an almost homogeneous distribution of mesoscale cyclones over the southeastern Pacific Ocean, they tend to cluster close to the coast. The figure also shows significant mesoscale activity over the Weddell Sea and Ronne Ice Shelf, as well as a few mesocyclones over the interior of West Antarctica. From the present study it is concluded that no clear linkage can be inferred between katabatic airflow and mesoscale cyclone activity over the southeastern Pacific Ocean, as is clearly found over the Ross Sea-Ross Ice Shelf area.

I-51379

Du, Y., Bromwich, D.H., **Katabatic airflows over Siple Coast, West Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.291-293, 10 refs.

The Siple Coast area, unlike most parts of Antarctica, has terrain slopes that are steeper in the interior than adjacent to the coast. The Siple Coast area was found to be one of the most significant confluence zones about the continental periphery. This paper analyzes the windfield over the Siple Coast area, simulated by the three-dimensional primitive equation model described by Parish and Waight (1987), and compares it with field observational data summarized by Bromwich (1986).

I-51388

Hernandez, G., Smith, R.W., Belinne, D.J., **Meteorological observations unique to the South Pole**, *Antarctic journal of the United States*, 1992, 27(5), p.314-315, 7 refs.

Optical measurements of the meteorology of the upper atmosphere are regularly made at Amundsen-Scott Station in order to provide an understanding of the properties and behavior of this region of the atmosphere at high latitudes. The authors obtained their measurements of the upper atmosphere during the austral winters of 1991 and 1992. The observations made during the month of Aug. 1991 are typical of the results obtained at Amundsen-Scott Station and are used here to illustrate the observed behavior.

I-51401

Booth, C.R., Lucas, T.B., Morrow, J.H., **High-resolution ultraviolet spectral irradiance monitoring program in polar regions: five years (and growing) of data available to polar researchers in ozone- and ultraviolet-related studies**, *Antarctic journal of the United States*, 1992, 27(5), p.338-341, 16 refs.

In the fall of 1987, responding to the serious ozone depletion reported in Antarctica, the Office of Polar Programs of the National Science Foundation called for the establishment of an ultraviolet monitoring system in Antarctica. The network was brought on-line in 1988, and the authors present the details of its operation and examples of recent data products. This is the first automated high-resolution ultraviolet scanning spectroradiometer network installed in the world. Spectroradiometers were installed in four antarctic locations between Feb. and Nov. 1988. A table lists the positions and the period of data referred to in this report for these sites. From 2 figures, the effect of ozone depletion over the South Pole can be clearly seen.

I-51429

Adriani, A., et al, **Polar stratospheric clouds over McMurdo, Antarctica, during the 1991 spring: lidar and particle counter measurements**, *Geophysical research letters*, Sep. 4, 1992, 19(17), p.1755-1758, 10 refs.

Lidar and balloonborne particle counter measurements were performed simultaneously on two days when polar stratospheric clouds were observed in late Aug. 1991 at McMurdo Station. Both nitric acid trihydrate and ice clouds were observed in the lower stratosphere between 10 and 23 km in different formation stages and with different cooling rates; however, in all cases the size distributions were bimodal. Comparison of scattering ratios measured by lidar and calculated from particle size distributions are in good agreement; however, discrepancies were observed when the lower stratosphere was highly perturbed by wave activity. Lee waves generated by air flowing over the Transantarctic Mountains induced ice cloud formation at altitudes as high as 20 km. No PSCs were observed after the end of Aug., 1991. (Auth.)

I-51430

Hogan, A., Riley, D., Murphey, B.B., Barnard, S.C., Samson, J.A., **Variation in aerosol concentration associated with a polar climatic iteration**, *American Geophysical Union. Antarctic research series*, 1993, Vol.61, Antarctic meteorology and climatology: studies based on automatic weather stations, p.175-199, Refs. p.196-199.

This paper presents analyses which follow warm, aerosol-laden cyclonic systems across the Ross Ice Shelf, using automatic weather station data. Subsequent discussion indicates that marine aerosol deposits in the interior antarctic ice may reflect a recent climatic iteration of surface temperature aerosol concentration. The antarctic continental (cA) air mass is rarely displaced from the south polar plateau, but is frequently modified by exchange with antarctic maritime (mA) air advected from the ice shelves or frozen seas or with polar maritime (mP) air advected from the southern oceans. Because the cA air mass resides over an uninhabited and relatively static ice-covered surface, the concentration of aerosol particles in this unique air mass may reflect aerosol variation in the global atmosphere. A continuous series of surface observations were begun at Amundsen-Scott Station in 1974 and have continued to the present. The decrease in aerosol concentration was greatest in late winter and spring, concurrent with decreases in mean air temperature and mean wind speed. This paper describes analytical techniques used to examine these apparent trends. It is concluded that the diminution in temperature, aerosol concentration, and sodium deposition are a consequence of a diminution in the frequency of cyclonic-related warming events. (Auth.)

I-51447

Isaksen, I.S.A., **Role of scientific assessments on climate change and ozone depletion for negotiations of international agreements**, *International challenges*, 1993, 13(2), p.76-84.

Scientists agree that the dramatic reduction in ozone observed over Antarctica this last decade is man-induced. It can be attributed to the increasing use of CFCs and bromine (halons) compounds throughout the seventies and eighties. The Montreal Protocol on global reductions of emissions of ozone-depleting substances (ODS) has led to pronounced reductions in ODS. However, measures to reduce man-made climate impact, particularly reductions of CO₂ emissions, will have far-reaching political consequences, and hence economic consequences for society. Political considerations therefore play a significant role in the negotiations on measures to reduce greenhouse gas emissions, and are making it harder to reach an agreement than in the successful negotiations on reductions of ODS.

I-51456

Jain, S.L., **Retrieval of ozone profiles over Antarctica using laser heterodyne system**, *Indian journal of radio and space physics*, Apr. 1992, 21(2), p.110-115, 31 refs.

DLC QC801.I42

A retrieval technique developed and tested to obtain vertical profiles of ozone from laser heterodyne system measurements using inversion technique, based on inverse solution of radiative transfer equation for antarctic environmental conditions, is discussed. The inverse technique was tested using actual vertical profiles of ozone obtained on Aug. 23, 1989 and Oct. 20, 1989 at McMurdo Station. The ozone absorption line selected is 1043.1175/cm, which is near the P(24) line of a CO₂ laser in the 9.6 micron band. Various line parameters, such as half-width, line strength, low energy level, etc. were computed using the AFGL HITRAN database, 1986. In all, 16 frequency channels were selected and spectral intensity for each channel was computed using O₃ profiles obtained at McMurdo. An initial guess profile was assumed and, corresponding to this profile, the spectral intensity of each channel was computed and compared with those obtained by actual profiles. The initial guess profile was modified until the two sets of spectral intensities matched each other. The retrieval profiles compare well with the actual O₃ profiles. (Auth. mod.)

I-51498

Jones, D.A., Simmonds, I., **Climatology of Southern Hemisphere anticyclones**, *Climate dynamics*, Sep. 1994, 10(6-7), p.333-348, 55 refs.

A climatology of anticyclones generated by an objective automatic scheme applied to 15 years of once-daily Australian Bureau of Meteorology hemispheric analyses is presented. Contour maps of the anticyclone system density, positions of formation and dissipation together with other statistics are shown. The distribution of anticyclones through the hemisphere was found to be dominated by a mid-latitude belt of high density, located in the band 25-42S, typically 2-4 deg south of the time-mean subtropical ridge. Within this band the anticyclone density displays considerable structure with greater system numbers over the eastern parts of the three subtropical ocean basins in the vicinity of the three subtropical ocean time-mean anticyclones. In the vicinity of the African and South American continents, movement was more complex with east-southeast motion upstream, and east-northeast movement downstream, the net transport being such as to encourage a general steering of systems around the continental land masses, more particularly during the warmer seasons. To highlight the dynamic role played by these systems and their cyclonic counterparts, a limited investigation of the response of Southern Hemisphere synoptic systems to variations of the broader atmospheric system is presented and compared to those obtained by more traditional analysis techniques. (Auth. mod.)

I-51499

Kane, R.P., **Non-uniform dissipation of the antarctic ozone hole**, *Mausam*, Jan. 1994, 45(1), p.23-28, With Hindi summary. 21 refs.

The springtime evolution of the antarctic ozone hole is illustrated for 1985-1989 and 1990. A detailed study of 1986-1989 and 1990 events indicates that the evolution, which occurs in early Oct., is fairly uniform over the South Pole. Hence the fluctuations observed at Showa, McMurdo and

Palmer during this period are mostly due to the vortex wall passing in and out over these peripheral locations. However, later in Nov. when the hole is dissipating, the vortex may shift from the South Pole in any direction and may also intensify before finally disappearing. At South Pole, the recovery started by October ended in 1985, 1986 and 1988 but later in 1987 (Nov. end), 1989 (Nov. beginning) and 1990 (Nov. end). (Auth. mod.)

I-51502

Cacho, J., Gil, M., Sainz de Aja, M.J., **Enhancement of surface ultraviolet radiation related to ozone depletion** [Aumentos en la irradiancia ultravioleta en la superficie de la Antártida asociados a la disminución de ozono estratosférico], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.9-16, In Spanish with English summary. 10 refs.

Hypothetical enhancement of surface ultraviolet radiation related to the ozone deflection is nowadays of great concern. In order to evaluate those estimated increases, the Laboratorio de Estudios de la Atmosfera (INTA) has developed an instrument to measure accurately the ultraviolet direct radiation. This instrument was operated in Antarctica during the 1989 austral spring. Observations show great irradiance enhancement in the central range of UVB, related to decreases in the total ozone content. Longer wavelengths in the irradiance were not noted. (Auth.)

I-51503

Marroquín, A., Amérigo, C., **Antarctic cryosphere and climatic change** [La criosfera antártica y el cambio climático], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.17-23, In Spanish with English summary. 12 refs.

The fact that the registered tropospheric temperatures from antarctic observatories do not show the global tendency towards heating, as do data gathered in other areas of the Southern Hemisphere, leads one to believe that the Antarctic is acting as a thermic drain; i.e. it transforms sensible heat into latent heat. This gives rise to a direct loss of ice mass through fusion and an even greater loss due to an increase in the shedding of massive blocks of ice. According to the models, if this climatic change continues it could cause an increase in sea level of up 2 m by the end of the next century. The most recent data from the IPCC (Intergovernmental Panel of Climatic Change) estimated a likely sea level increase of 65 cm. (Auth.)

I-51504

Bañón García, M., **Climatic observations of South Shetland Is. and the Antarctic Peninsula at Juan Carlos I Station** [El clima en las Shetland del Sur y el norte de la península Antártica. Caso de la B.A.E. "Juan Carlos I"], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.25-39, In Spanish with English summary. 12 refs.

A descriptive study is presented of the climatological conditions at South Shetland Is. and the northern Antarctic Peninsula. Meteorological variables measured at various synoptic observatories are compared with data, summarized and presented in maps and charts, obtained at Juan Carlos I Station.

I-51505

Cisneros, J.M., Hoevel, R., Manzano, J., Orbe, J., **Three summer campaigns on Livingston I. measuring ozone** [Tres campañas de verano en la isla Livingston midiendo ozono], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by

J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.41-47, In Spanish with English summary. 4 refs.

Vertical ozone distribution measurements were obtained between 22.00 and 02.00 hours (UT) with balloonborne sonde at an altitude of 30 km above the Juan Carlos I Station. The instruments used (ECC type) are described. Some features of these vertical ozone distribution profiles are compared with the vertical mean distributions from diverse latitude bands obtained in both hemispheres during different seasons. (Auth. mod.)

I-51535

Roche, A.E., et al, **Observations of lower-stratospheric ClONO₂, HNO₃, and aerosol by the UARS CLAES experiment between January 1992 and April 1993**, *Journal of the atmospheric sciences*, Oct. 15, 1994, 51(10), p.2877-2902, 33 refs.

This paper discusses simultaneous measurements of stratospheric ClONO₂, HNO₃, temperature, and aerosol extinction coefficient by the Cryogenic Limb Array Etalon Spectrometer (CLAES) on the NASA Upper Atmosphere Research Satellite (UARS), obtained over the period Jan. 9, 1992 through Apr. 23, 1993. The discussion concentrates on the stratosphere region near 21 km as of particular interest to heterogeneously driven ozone depletion. For periods between June 12 and Sep. 1, 1992 at latitudes poleward of about 60S, when temperatures were below type I polar stratospheric cloud (PSC) formation thresholds throughout the lower stratosphere, CLAES observed high levels of PSCs coincident with highly depleted fields of both HNO₃ and ClONO₂. By Sep. 17 the incidence of PSCs had greatly diminished in the lower stratosphere, but both ClONO₂ and HNO₃ remained highly depleted. These observations are consistent with the removal of gaseous HNO₃ through the formation of nitric acid trihydrate (NAT) particles and the removal of ClONO₂ through heterogeneous reactions on the particle surfaces. They also suggest substantial denitrification of the lower antarctic vortex through sedimentation of PSC particles. (Auth. mod.)

I-51536

Park, J.H., Russell, J.M., III, **Summer polar chemistry observations in the stratosphere made by HALOE**, *Journal of the atmospheric sciences*, Oct. 15, 1994, 51(10), p.2903-2913, 21 refs.

Regions of low stratospheric ozone that are anticorrelated with HCl, NO, and NO₂ levels were observed in the arctic and antarctic summers of 1992 and 1993 by the Halogen Occultation Experiment on the Upper Atmospheric Research Satellite platform. The low ozone areas are confined to the 8-45 mb (33-21 km) region and poleward of 60 deg in each hemisphere. While low polar summer ozone has been observed before, this is the first time simultaneous observations of relevant nitrogen and chlorine chemical species have been made. The phenomenon appears to be a recurring geophysical feature; the satellite data should provide an excellent opportunity to improve understanding of the chemistry causing these conditions. (Auth. mod.)

I-51537

Pierce, R.B., et al, **Spring dehydration in the antarctic stratospheric vortex observed by HALOE**, *Journal of the atmospheric sciences*, Oct. 15, 1994, 51(10), p.2931-2941, 13 refs.

The distribution of dehydrated air in the middle and lower stratosphere during the 1992 Southern Hemisphere spring is investigated using Halogen Occultation Experiment (HALOE) observations and trajectory techniques. Comparisons between previously published Version 9 and the improved Version 16 retrievals on the 700-K isentropic surface show very slight (0.05 ppmv) increases in Version 16 CH₄ relative to Version 9 within the polar vortex. Version 16 H₂O mixing ratios show a reduction of 0.5 ppmv relative to Version 9 within the polar night jet and a reduction of nearly 1.0 ppmv in middle latitudes when compared to Version 9. The Version 16 HALOE retrievals show low mixing ratios of total hydrogen (2CH₄ + H₂O) within the polar vortex on both 700 and 425 K isentropic surfaces relative to typical middle-stratospheric 2CH₄ + H₂O mixing ratios. The low 2CH₄ + H₂O mixing ratios are associated with dehydration. Slight reductions in total hydrogen, relative to typical middle-stratospheric values, are found at these levels throughout the Southern Hemisphere during this period. (Auth. mod.)

I-51538

Bithell, M., et al, **Synoptic interpretation of measurements from HALOE**, *Journal of the atmospheric sciences*, Oct. 15, 1994, 51(10), p.2942-2956, 41 refs.

The degree to which the Southern Hemisphere polar vortex is isolated against horizontal (isentropic) mixing is investigated using data from the Halogen Occultation Experiment (HALOE), U.K. Meteorological Office (UKMO) potential vorticity (PV), and contour advection diagnostics. Measurements of methane and water vapor taken by HALOE during a disturbed period in the Southern Hemisphere springtime (Sep. 21-Oct. 15, 1992) are interpreted in light of the prevailing synoptic meteorology. Daily fields of winds and PV are shown to be essential in the interpretation of the data. A climatological high pressure region is responsible for a distorted vortex, and a substantial "vortex stripping" event is present, associated with the early stages of vortex breakdown. This leads to significant temporal, zonal, and altitudinal variations in the distribution of tracers. Longitude-height methane distributions from two days during the period are examined. Both days show substantial variations in abundance around a latitude circle. In particular, the authors investigated HALOE measurements at 77S on Oct. 15, 1992, which indicated an abundance of methane in the height region 600-2000 K that is more typical of mid-latitude air. Similar distributions observed in the 1991 HALOE data have previously been interpreted as evidence for the penetration of mid-latitude air into the vortex. The authors show that the high-latitude HALOE abundances that are typical of mid-latitude air were observed in a region of extensive filamentation and mixing, rather than within the inner more isolated core. (Auth. mod.)

I-51539

Pierce, R.B., et al, **Mixing processes within the polar night jet**, *Journal of the atmospheric sciences*, Oct. 15, 1994, 51(10), p.2957-2972, 21 refs.

Lagrangian material line simulations are performed using U.K. Meteorological Office assimilated winds and temperatures to examine mixing processes in the middle- and lower-stratospheric polar night jet during the 1992 Southern Hemisphere spring and Northern Hemisphere winter. The Lagrangian simulations provide insight into the effects of mixing within the polar night jet on observations of the polar vortex made by instruments onboard the Upper Atmosphere Research Satellite during these periods. A moderate to strong kinematic barrier to large-scale isentropic exchange, similar to the barrier identified in GCM simulations, is identified during both of these periods. Characteristic timescales for mixing by large-scale isentropic motions within the polar night jet range from 20 days in the Southern Hemisphere lower stratosphere to years in the Northern Hemisphere middle stratosphere. The long mixing timescales found in the Northern Hemisphere polar night jet do not persist. Instead, the Northern Hemisphere kinematic barriers are broken down as part of the large-scale stratospheric response to a strong tropospheric blocking event. A series of Lagrangian experiments are conducted to investigate the sensitivity of the kinematic barrier to diabatic effects and to small-scale inertial gravity wave motions. Differential diabatic descent is found to have a significant impact on mixing processes within the Southern Hemisphere middle-stratospheric jet core. (Auth. mod.)

I-51540

Manney, G.L., Zurek, R.W., O'Neill, A., Swinbank, R., **On the motion of air through the stratospheric polar vortex**, *Journal of the atmospheric sciences*, Oct. 15, 1994, 51(10), p.2973-2994, 44 refs.

Trajectory calculations using horizontal winds from the U.K. Meteorological Office data assimilation system and vertical velocities from a radiation calculation are used to simulate the three-dimensional motion of air through the stratospheric polar vortex for Northern Hemisphere (NH) and Southern Hemisphere (SH) winters since the launch of the Upper Atmosphere Research Satellite. Throughout the winter, air from the upper stratosphere moves poleward and descends into the middle stratosphere. In the SH lower to middle stratosphere, strongest descent occurs near the edge of the polar vortex, with that edge defined by mixing characteristics. The NH shows a similar pattern in late winter, but in early winter strongest descent is near the center of the vortex, except when wave activity is particularly strong. Strong barriers to latitudinal mixing exist above about 420 K throughout the winter. Below this, the polar night jet is weak in early winter, so air descending below that level mixes between polar and

middle latitudes. In late winter, parcels descend less and the polar night jet moves downward, so there is less latitudinal mixing. The degree of mixing in the lower stratosphere thus depends strongly on the position and evolution of the polar night jet and on the amount of descent experienced by the air parcels; these characteristics show considerable interannual variability in both hemispheres. (Auth. mod.)

I-51541

Massie, S.T., et al, **Spectral signatures of polar stratospheric clouds and sulfate aerosol**, *Journal of the atmospheric sciences*, Oct. 15, 1994, 51(10), p.3027-3044, 47 refs.

Multiwavelength observations of antarctic and mid-latitude aerosol by the Cryogenic Limb Array Etalon Spectrometer (CLAES) experiment on the Upper Atmosphere Research Satellite are used to demonstrate a technique that identifies the location of polar stratospheric clouds. The technique discussed uses the normalized area of the triangle formed by the aerosol extinctions at 925, 1257, and 1605/cm (10.8, 8.0, and 6.2 microns) to derive a spectral aerosol measure M of the aerosol spectrum. Mie calculations for spherical particles and T-matrix calculations for spheroidal particles are used to generate theoretical spectral extinction curves for sulfate and polar stratospheric cloud particles. The values of the spectral aerosol measure M for the sulfate and polar stratospheric cloud particles are shown to be different. Aerosol extinction data corresponding to temperatures between 180 and 220 K at a pressure of 46 hPa (near 21 km altitude) for Aug. 18, 1992 are used to demonstrate the technique. (Auth. mod.)

I-51556

International Symposium, Belgirate, Italy, Oct. 13-15, 1992, Restelli, G., ed, Angeletti, G., ed, **Dimethylsulphide: oceans, atmosphere and climate**, Dordrecht, Kluwer Academic Publishers, 1993, 399p., Refs. passim. For selected papers see B-51557, F-51561, I-51559, J-51558 and J-51560.

DLC QC879.6.D56

This volume contains 5 papers pertinent to Antarctica, distributed as follows: 2 deal with DMS production by marine phytoplankton, and 3 deal with field measurements of DMS at Ross I., the Weddell Sea, and in Terra Nova Bay.

I-51559

Wylie, D.J., et al, **Dimethylsulphide and aerosol measurements at Ross Island, Antarctica**, International Symposium, Belgirate, Italy, Oct. 13-15, 1992. Proceedings. Dimethylsulphide: oceans, atmosphere and climate, edited by G. Restelli and G. Angeletti and Air Pollution Research Report 43, Dordrecht, Kluwer Academic Publishers, 1993, p.85-94, 28 refs.

DLC QC879.6.D56

In the summer of 1991-92 a study was made of dimethylsulphide (DMS) and sulfur-containing aerosols in the marine boundary layer over McMurdo Sound. The concentration and size distribution of aerosols and meteorological variables were measured. The site was characterized by high concentrations of DMS, aerosol methanesulfonate and aerosol non-sea salt sulfate. Wind speed had the most significant influence on the observed high concentrations of DMS. Measurements of condensation nuclei were made over a wide range of accumulation mode and coarse mode concentrations. During episodes of large total aerosol surface area, the numbers of condensation nuclei recorded tended to be few; conversely, when surface area was small, the number of nuclei was largest. This observation suggests that new particle generation is suppressed when the total aerosol concentration is large, as the aerosol apparently provides a surface sink for the precursor gases. New particle generation was most active following the major depletion of accumulation and coarse mode aerosol by precipitation scavenging during snowfall. (Auth. mod.)

I-51562

Chen, P., **Permeability of the antarctic vortex wedge**, *Journal of geophysical research*, Oct. 20, 1994, 99(D10), p.20,563-20,571, 27 refs.

Mixing and cross-vortex mass transport along isentropic surfaces in the lower stratosphere are investigated with a "contour advection" technique and semi-Lagrangian transport model for the antarctic winter of 1993, using analyzed winds from the United Kingdom Meteorological

Office data assimilation system. Results from the "contour advection" technique show that at the vortex edge there exists a potential vorticity (PV) contour that has the smallest lengthening rate. This PV contour is referred to as the "line of separation" because it essentially separates the inner and outer vortex. The average e-folding time for the lengthening of the "line of separation" increases monotonically with altitude, ranging from about 7 days on the 350 K isentropic surface to about 105 days on the 500 K isentropic surface. The results also suggest the existence of a transition layer around the 400 K isentropic surface, above which the vortex is almost completely isolated from the mid-latitudes and below which the vortex is less isolated. (Auth. mod.)

I-51563

Tuck, A.F., et al, **Spread of denitrification from 1987 antarctic and 1988-1989 arctic stratospheric vortices**, *Journal of geophysical research*, Oct. 20, 1994, 99(D10), p.20,573-20,583, 52 refs.

Vertical profiles of N_2O and NO_y taken by the ER-2 aircraft outside both polar vortices are used to construct average vertical profiles of $F(NO_y) = NO_y / (A - N_2O)$, where A is the tropospheric content of N_2O three years prior to the measurements. The Southern Hemisphere had less nitrous oxide in the range $400 < \theta < 470$ K, by up to 25% relative to the Northern Hemisphere. $F(NO_y)$ is the ratio of NO_y produced to N_2O lost in a stratospheric air mass since entry from the troposphere. The profiles of $F(NO_y)$ have the following characteristics: (1) relative to 1991-92, a year without denitrification inside or outside the vortex, the Northern Hemisphere in 1988-89 showed denitrification outside the vortex ranging up to 25% and averaging 17% above $\theta = 425$ K. (2) Relative to the Northern Hemisphere in 1991-92, the Southern Hemisphere in 1987 showed denitrification outside the vortex ranging up to 32% and averaging 20% above $\theta = 400$ K. (3) Below $\theta = 400$ K the Southern Hemisphere showed enhancements of $F(NO_y)$ relative to the Northern Hemisphere in 1991-92 ranging up to 200% at $\theta = 375$ K, outside the vortex. Comparison of $F(NO_y)$ and $R(H_2O)$ below 400 K outside the antarctic vortex leads to the suggestion that dehydration in the antarctic vortex occurs by the sedimentation of ice crystals large enough to fall out of the stratosphere, whereas denitrification occurs mainly on mixed nitric acid-water crystals which evaporate below the base of the vortex at $\theta = 400$ K but above the tropopause. (Auth. mod.)

I-51564

Kulikov, I.U., et al, **Stratospheric ozone variability in high latitudes from microwave observations**, *Journal of geophysical research*, Oct. 20, 1994, 99(D10), p.21,109-21,116, 24 refs.

Results of microwave studies of stratospheric ozone above ca. 20 km in both arctic and antarctic regions in the years 1986-1990 are presented. Measurements were performed with a ground-based spectral heterodyne receiver. The technique is based on the measurements of atmospheric ozone emission in lines of rotational transitions corresponding to frequencies of about 102 and 142 GHz. The main result of the investigations is the detection of rather strong stratospheric ozone variability above 20 km. The characteristic timescales of these variations extend from a few hours in some periods of observation to periods of days, weeks, or months. (Auth. mod.)

I-51574

Solomon, S., et al, **Polar ozone**, *World Meteorological Organization. Global Ozone Research and Monitoring Project. Report*, [1990], No.20, Scientific assessment of stratospheric ozone: 1989. Volume 1., p.1-161, Refs. p.145-161.

DLC QC881.2.O9S35 1990

Ozone depletion, or the ozone hole, has been observed with the return of sunlight in the early antarctic spring every September since 1978. Though some loss has also been detected in the Arctic where the atmosphere begins to warm prior to the return of sunlight, the loss is much less than in the Antarctic, averaging about 5% as opposed to 50% with losses as much as 95% recorded locally at altitudes of 10-25 km, and apparently occurs relatively earlier, in January or February of the arctic winter. It is proposed that the ozone hole, especially in the Antarctic, is due to a process where polar stratospheric clouds (PSCs) consisting of nitric acid trihydrate ($HNO_3 \cdot 3H_2O$) ice particles provide surfaces on which chlorine released from the breakdown of chlorofluorocarbons (CFCs) by sunlight forms hydrogen chloride (HCl) and chlorine nitrate ($ClONO_2$) which then,

also in the presence of sunlight, undergo heterogeneous chemical reactions yielding chlorine monoxide (ClO) which initiates the catalytic destruction of ozone.

I-51575

Boden, T.A., ed, Kaiser, D.P., ed, Sepanski, R.J., ed, Stoss, F.W., ed, **Trends '93: a compendium of data on global change**, Oak Ridge, TN, Oak Ridge National Laboratory, Carbon Dioxide Information Analysis Center, 1994, 984p. + appends., Refs. passim.

This document provides synopses of frequently used global-change data. This third issue of the Trends series presents historical and modern records of atmospheric concentrations of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), two chlorofluorocarbons (CFC-11 and CFC-12), a hydrochlorofluorocarbon (HCFC-22), and two halons (H-1301 and H-1211) from an expanded number of globally distributed data sets. Virtually all of the modern records extend into the 1990s, some into 1994. Additional trace gas data presented in Trends '93 include historical atmospheric CO_2 , CH_4 , and N_2O records derived from ice cores. Updated global emissions estimates through 1992 are also presented for CFC-11 and CFC-12. In addition, Trends '93 updates and expands the presentation of long-term temperature records, whose spatial coverage ranges from an individual antarctic (ice core) site to the entire globe and from the Earth's surface to the lower stratosphere. The data records from Antarctica were obtained from the Amundsen-Scott, Byrd, Halley, Palmer, Showa, Siple, and Vostok stations and Law Dome ice cores. (Auth. mod.)

I-51576

Schmidt, T., Langlo, G.K., **Radiation measurements at the German antarctic Station Neumayer 1982-1992**, *Berichte zur Polarforschung*, 1994, No.146, 66p., 12 refs.

Since Mar. 1981, meteorological measurements have been carried out continuously at the German Neumayer antarctic research station. The program of the meteorological observatory consists of routine synoptic observations, standard near-surface measurements, surface radiation measurements, upper air soundings, and air chemistry measurements. The meteorological data are postprocessed and archived in the Meteorological Information System of the Alfred Wegener Institute. This report provides a description of the surface radiation measurements obtained from Mar. 13, 1982 to Dec. 31, 1992.

I-51590

Toumi, R., Bekki, S., Law, K.S., **Indirect influence of ozone depletion on climate forcing by clouds**, *Nature*, Nov. 24, 1994, 372(6504), p.348-351, 30 refs.

It is shown that ozone depletion may also exert an indirect effect on radiative forcing via its effect on the oxidation state of the atmosphere. Hydroxyl (OH) radicals in the troposphere are produced by photodissociation of tropospheric ozone in the presence of water vapor, and this process is enhanced if the absorption of ultraviolet radiation by the overlying stratospheric ozone column decreases. As OH oxidizes SO_2 to sulphuric acid, which then forms cloud condensation nuclei, variations in tropospheric OH concentration can influence cloud albedo. The authors use a global two-dimensional model forced by observed changes in stratospheric ozone to calculate the consequent changes in production of sulphuric acid over the past decade, and thus to estimate the effect on cloud albedo. It appears that this indirect effect of ozone depletion may decrease radiative forcing (via increased cloud reflectivity) by at least as much as the direct effect. Graphic displays included with this essay depict global changes of hydroxyl radicals and sulphuric acid to about 85 deg N and S latitudes at altitudes to 300 hPa. (Auth. mod.)

I-51596

Jochmann, H., et al, **Earth rotation and global change**, *Advances in space research*, Nov. 1993, 13(11), p.(11)271-(11)280, 8 refs.

Investigations of global change require information from different fields of geosciences. Since global change is accompanied by mass redistribution in the atmosphere, the hydrosphere and the cryosphere, influences on the Earth's rotation can be expected. Studies of relations between climate change and Earth rotation showed a statistical correlation between the variation of different climate parameters and the length of day; How-

ever, a physical proof failed. This fact induced the authors to use the results of theoretical climate models for estimating possible influences on Earth rotation. Therefore, the excitation of polar motion and the antarctic ice sheet were studied. A further subject discussed is the influence of climate change on the parameters of the seasonal variations of polar motion. (Auth.)

I-51626

Cotton, J.H., Michael, K.J., **Monitoring of katabatic wind-coastal polynya interaction using AVHRR imagery**, *Antarctic science*, Dec. 1994, 6(4), p.537-540, 23 refs.

Coastal polynyas, which form around the antarctic coast due to persistent katabatic winds, play an important role in enhancing air-sea interaction. This paper discusses how thermal imagery from the Advanced Very High Resolution Radiometer (AVHRR) can be used to track the direction of katabatic winds, and hence to facilitate research into air-sea interaction. (Auth.)

I-51627

European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990, Pyle, J.A., ed, Harris, N.R.P., ed, **Proceedings**, Air pollution research report 34, Brussels, Commission of the European Communities, [1991], 306p., Refs. passim. For selected papers see 49-1269 through 49-1306 or I-51628 through I-51637.

DLC QC879.73.P6P65 1991

Most of the more than 50 papers deal mainly with ozone in the northern polar stratosphere, including both field observations and laboratory experiments, but 10 papers are pertinent to Antarctica. The workshop was divided into four sessions: polar ozone, chemical processes, polar stratospheric clouds, and modeling. Currently the most widely accepted theory is that ozone is destroyed by reactions involving chlorine and to a lesser extent bromine compounds, and that polar stratospheric clouds play important roles in chemical conversion, dehydration and denitrification.

I-51628

Goutail, F., Pommereau, J.P., **Comparison of ground-based SAOZ and satellite TOMS total ozone observations at polar latitudes**, European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990. Proceedings. Edited by J.A. Pyle and N.R.P. Harris, Brussels, Commission of the European Communities, [1991], p.37-40, 3 refs.

Global total ozone distributions have been observed by TOMS since 1978, in particular above Antarctica where the experiment provided most of the knowledge of the geographic and time extension of the ozone hole. However, because ultraviolet ground-based instruments like Dobson and Brewer spectrophotometers are not operating at solar zenith angles larger than 80-82 deg SZA, no validation of TOMS data at high latitude in winter, the time of the ozone hole, is available. Total ozone measurements in the visible Chappuis bands with a diode array spectrometer now make observations possible up to 91 deg SZA throughout the year at the polar circle. Long series of data from instruments installed at three different polar stations: Dumont d'Urville since Jan. 1988, Søndre Strømfjord in Greenland since Nov. 1988, Kiruna in Sweden and Sodankylä in Finland during winter campaigns in 1988 and 1990, are now available. They have been systematically compared to TOMS overhead observations. (Auth.)

I-51629

Keys, J.G., Gardiner, B.G., **Overnight decay of NO₂ as observed at Halley Bay and calculated from ozone and temperature profiles**, European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990. Proceedings. Edited by J.A. Pyle and N.R.P. Harris, Brussels, Commission of the European Communities, [1991], p.69-72, 4 refs.

The decay of NO₂ after sunset is governed by the temperature and the local concentration of ozone, as NO₂ is converted first to NO₃ by reaction with ozone, and thence to N₂O₅. Calculations of the sunrise-to-sunset ratio of NO₂ have been made for Halley Bay, based on balloon-borne ozone and temperature profiles in the autumn and spring of 1987, a year in which the ozone depletion was particularly marked. In regions where the ozone and temperature profiles show a steep vertical gradient, the calcu-

lated sunrise-to-sunset ratios of NO₂ will be rather sensitive to altitude. These calculations can be reconciled with simultaneous measurements of column NO₂ by ground-based visible spectrometry at Halley Bay, provided that the bulk of the NO₂ layer is assumed to lie at a height of about 25 km, well above the center of the ozone depletion region. (Auth.)

I-51630

Gil, M., Cacho, J., **Positive correlation of total column of nitrogen dioxide with ozone in the boundary zone of the antarctic polar vortex during the spring time**, European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990. Proceedings. Edited by J.A. Pyle and N.R.P. Harris, Brussels, Commission of the European Communities, [1991], p.73-76, 11 refs.

A high positive correlation of NO₂ with ozone has been found in the Antarctic Peninsula (Marambio Station) during the ozone depletion period. Observations were carried out from Sep. to Nov. of 1989 by ground-based differential absorption spectrometry. NO₂ total amounts remained at low levels until the end of Oct. From that date, a steady increase occurred, doubling in value in less than one month. Oscillation with an 11 day period and amplitudes of 30% of total column in both NO₂ and ozone show the strong modulation of these constituents by planetary wave activity in the late stages of vortex life.

I-51631

Roscoe, H.K., Farman, J.C., Waters, J.W., Kerridge, B.J., Matheson, D.N., **Proposed ground-based microwave radiometer (GMR) at 278 GHz, to measure N₂O, ClO, HNO₃, O₃ and HCN in the antarctic stratosphere**, European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990. Proceedings. Edited by J.A. Pyle and N.R.P. Harris, Brussels, Commission of the European Communities, [1991], p.95-98, 6 refs.

Because significant antarctic ozone depletion occurs below 20 km, a radiometer with sufficient bandwidth to measure ClO down to 18 km simultaneously with other constituents which emit near 278 GHz would be especially useful during winter and spring in Antarctica, because by observing N₂O and HCN, the timing and extent of downward motion (descent) would be determined. Descent of stratospheric air is necessary for the high levels of HCl and ClNO₃ which give rise to the observed high levels of ClO in the spring; HNO₃ is important to the creation of the ozone hole; and there are no measurements of ozone throughout winter in Antarctica. Microwave radiometers have important advantages over other ground-based sensors for the following reasons: they can observe throughout the winter night; signals are negligibly attenuated by ice clouds and PSCs; signals are only weakly dependent on atmospheric temperature; measurements of ClO are possible; and profiles of concentration can be retrieved, with a vertical resolution of about 10 km or better. (Auth. mod.)

I-51632

Kokin, G.A., Khattatov, V.U., Iushkov, V.A., **Soviet investigations of the ozone layer in the Arctic and Antarctic during winter-spring time**, European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990. Proceedings. Edited by J.A. Pyle and N.R.P. Harris, Brussels, Commission of the European Communities, [1991], p.119-121.

Regular studies of the ozone layer in spring at Molodezhnaya and Mirnyy stations were initiated in 1987. Four spring-time campaigns have been conducted during which ozone vertical distribution was measured using balloon and rocket-borne ozonometers, while for total ozone measurements ground-based spectrophotometers were used. Comparisons with data from other antarctic stations have shown good agreement of the observational results, with the general picture of the detected abnormal ozone depletion and its relationship with thermobaric structure and circulation. Analysis of the sets of total ozone observations has demonstrated that, as a rule, maximum ozone values are simultaneous with the periods of stratospheric warmings. In Oct. in the Indian sector of the Antarctic a large meridional total ozone gradient was observed, resulting in total ozone increase from 350 up to 450 DU, with subsequent decrease within the circumpolar vortex. Such investigations seem to be important for the study of the global balance of ozone and of processes responsible for its redistribution. (Auth. mod.)

I-51633

Hayman, G.D., Jenkin, M.E., Cox, R.A., Parr, A.D., Wayne, R.P., **Recent studies of chlorine oxide radical reactions potentially important for polar ozone chemistry**, European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990. Proceedings. Edited by J.A. Pyle and N.R.P. Harris, Brussels, Commission of the European Communities, [1991], p.133-136, 12 refs.

Elevated concentrations of the ClO radical and the OClO molecule have been measured in the springtime polar stratospheres. Renewed interest in the gas-phase chemistry of halogen oxide radicals has resulted from these measurements because of their role in the major losses of ozone observed over Antarctica at these times. OClO itself does not cause ozone depletion but acts as a tracer for BrO radicals which are involved in ozone depletion. The reaction between BrO and ClO radicals is the only known source for OClO in the atmosphere. The UV-absorption spectrum of Cl₂O₃ has been recorded and quantified using chemical mass balance. The spectral parameters were then used to derive thermochemical data for the reaction forming Cl₂O₃. (Auth. mod.)

I-51634

Birk, M., Friedl, R.R., Cohen, E.A., **Quantitative analysis of the products of the ClO self reaction at low temperatures**, European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990. Proceedings. Edited by J.A. Pyle and N.R.P. Harris, Brussels, Commission of the European Communities, [1991], p.137-140, 8 refs.

The relative intensities of individual rotational absorption lines of ClOCl (precursor), ClO, ClOOCl and OClO have been measured in the submillimeter wave region around 400 GHz. Stark measurements were taken to estimate the dipole moments of ClOCl and ClOOCl thus allowing calculation of relative concentrations. At low initial ClO concentrations, ClOOCl product accounts entirely for the reacted ClO within experimental uncertainty. It follows that ClOOCl is the major product of the ClO self reaction at polar stratospheric conditions. (Auth. mod.)

I-51635

Godin, S., Mégie, G., Stefanutti, L., Morandi, M., Del Guasta, M., **Polar stratospheric cloud observations over the antarctic continent at Dumont d'Urville**, European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990. Proceedings. Edited by J.A. Pyle and N.R.P. Harris, Brussels, Commission of the European Communities, [1991], p.203-206, 4 refs.

The Polar Ozone Lidar Experiment (POLE) is organized under an Italian-French cooperation program for antarctic research, in the framework of the Italian National Program for Antarctic Research (PNRA) and the Territories des Terres Australes et Antarctiques Françaises (TAAF). The first step in this program was the implementation at Dumont d'Urville of a lidar designed for both tropospheric cloud and stratospheric aerosol measurements. The system operates at 0.53 micron, with a linearly polarized laser pulse and a repetition rate of 4 Hz. Both the signals in the parallel and perpendicularly polarized planes relative to the emitted laser radiation are collected; thus depolarization induced by non-spherical particles, such as ice crystals, is measured. The system was transported to Dumont d'Urville in Dec. 1988 and started operation in Jan. 1989. The lidar was operated twice a week until the end of Apr. 1989 for stratospheric aerosol measurements. The frequency of these measurements was then increased throughout the winter and spring in order to provide an appropriate database on PSCs. Typically during the polar night, averaging was performed over 500 shots (2.5 minutes), while 2000 shots (10 minutes) were necessary during daytime conditions. Beginning with June, whenever stratospheric lidar measurements were performed daily the meteorological conditions were favorable. (Auth. mod.)

I-51636

Gernandt, H., **Stratospheric ozone observations in Antarctica since 1985**, European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990. Proceedings. Edited by J.A. Pyle and N.R.P. Harris, Brussels, Commission of the European Communities, [1991], p.249-253.

Regular balloon-borne ozone observations have been performed at Georg Forster (GF) Station since 1985. These long-term data are considered with similar measurements between 1986 and 1990 made at other antarctic stations. The long-term mean stratospheric ozone distribution calculated from GF data is shown graphically. In regard to the polar night vertical ozone distribution, two depleted regions can be identified: one as the spring depletion and the other appearing with increasing solar radiation during the polar day. (Auth.)

I-51637

Pirre, M., Le Texier, H., Goutail, F., Pommereau, J.P., Ramaroson, R., **Seasonal behavior of NO₂ total column at polar circle**, European Workshop on Polar Stratospheric Ozone Research, 1st, Schliersee, Germany, Oct. 3-5, 1990. Proceedings. Edited by J.A. Pyle and N.R.P. Harris, Brussels, Commission of the European Communities, [1991], p.263-266, 7 refs.

NO₂ and O₃ total column have been monitored for almost 3 years at Dumont d'Urville and for 2 years at Søndre Strømfjord, Greenland by ground-based visible spectrometry. NO₂ total column and its "diurnal variation" display repeated seasonal behavior. Seasonal variations of the NO₂ column are very similar in both hemispheres, even though seasonal variations of ozone total column are very different. Discussion here is limited to the Southern Hemisphere. First comparisons with model simulations are shown for the seasonal variation of the total column of NO₂ and of its "diurnal variation". (Auth.)

I-51651

Japanese Antarctic Research Expedition, **Antarctic meteorological data. Special volume No.5. Summary of surface and aerological observations at Syowa Station (1957-1993)**, Tokyo, Japan Meteorological Agency, 1994, 341p.

This special issue contains recalculated summaries of surface and aerological observations at Showa Station from 1957 to 1993. It consists of three sections: monthly and yearly summaries of surface data, 1957-1993; daily summaries of surface data, 1957-1993; and monthly summaries of aerological data, 1959-1993.

See also:

A-50034 A-50035 A-50288 B-49714 B-49721 B-49933 B-50073
B-50147 B-50608 B-50619 B-50622 B-50669 B-50827 B-50828
B-50829 B-50916 B-51222 B-51246 B-51247 B-51248 B-51557
E-49631 E-49667 E-49668 E-49725 E-50113 E-50145 E-50203
E-50635 E-50874 E-50875 E-51297 F-49537 F-49542 F-49552
F-49643 F-49645 F-49703 F-49780 F-49809 F-49819 F-49947
F-49988 F-50014 F-50019 F-50020 F-50027 F-50153 F-50168
F-50188 F-50212 F-50305 F-50358 F-50381 F-50401 F-50402
F-50531 F-50533 F-50540 F-50543 F-50584 F-50634 F-50644
F-50646 F-50667 F-50682 F-50698 F-50714 F-50719 F-50799
F-50948 F-51040 F-51072 F-51220 F-51228 F-51241 F-51242
F-51244 F-51280 F-51302 F-51304 F-51380 F-51381 F-51459
F-51486 F-51547 F-51561 F-51625 G-49673 G-50196 J-49548
J-49641 J-50048 J-50121 J-50148 J-50306 J-50307 J-50372
J-50697 J-50734 J-50836 J-51038 J-51041 J-51043 J-51108
J-51176 J-51497 J-51509 J-51560 J-51579 K-49832 K-49888
K-50681 K-50747

J. OCEANOGRAPHY

J-49513

Domack, E.W., Ishman, S., **Oceanographic and physiographic controls on modern sedimentation within antarctic fjords**, *Geological Society of America. Bulletin*, Sep. 1993, 105(9), p.1175-1189, 36 refs.

Physical oceanographic data and modern surface sediments were collected from 11 fjords along the western side of the Antarctic Peninsula and South Shetland Is. Distribution of biogenic and terrigenous facies within the fjords is controlled by bay geometry and oceanographic regime. Climate plays a secondary role but, along with ice drainage basin size, controls the rate of terrigenous supply to the glacial marine environment. Biogenic facies are favored where the bay geometry is complex. Separate oceanographic regimes develop that lead to separation of terrigenous and biogenic sediments. Processes of interflow (mid- and deep-water turbid cold tongues) and Coriolis deflection produce terrigenous facies along the inner fjord and western edges of a fjord system. Warm outer bay waters tend to develop a stable eddy circulation pattern that favors the productivity of phytoplankton in the surface layers. Outer bays are therefore floored with organic-rich siliceous muds and ice-rafted material. Only in the South Shetland Is. is meltwater input significant enough to generate estuarine circulation within the fjord, but here strong bottom currents result in arenaceous bottom sediments with no biogenic facies. Ice-rafted diamictos are produced proximal to the edges of small tidal water glaciers in the South Shetlands. (Auth. mod.)

J-49514

Park, Y.H., Gamberoni, L., Charriaud, E., Gonella, J., **Does "Novara Knoll" exist**, *Deep-sea research*, Apr. 1993, 40(4), p.879-882, 9 refs.

The existence of this marine feature is questioned after the *Marion Dufresne*, en route to the Kerguelen Is. from Amsterdam I., on a cruise to measure the structure of the Antarctic Circumpolar Current, found no changes in the bottom depth measurements at the published Novara Knoll location. It is concluded that such a sea mount does not exist.

J-49523

Whitehouse, M.J., Symon, C., Priddle, J., **Variations in the distribution of chlorophyll *a* and inorganic nutrients around South Georgia, South Atlantic**, *Antarctic science*, Dec. 1993, 5(4), p.367-376, Refs. p.375-376.

Data collected on four large-scale surveys around the subantarctic island of South Georgia provide information on the variability in the distribution of chlorophyll and inorganic nutrients during the austral summer and winter. During 3 summer surveys, surface water chlorophyll and nutrient concentrations were highly patchy over scales ranging from a few to hundreds of kilometers. The highest measurement of chlorophyll *a* was 8 mg/cu m and a wide range of nutrient concentrations was found; 5-32 mmol/cu m NO₃-N, 1.1-2.2 mmol/cu m PO₄-P and 8-60 mmol/cu m Si(OH₄)-Si. In winter, chlorophyll and nutrient levels were far more uniform, with chlorophyll concentrations lower and nutrient concentrations generally higher than in summer. The spatial variability in nutrient concentrations was due to a variety of factors acting over a range of scales, but biological processes appeared most important in creating the mesoscale patchiness around the island. Although phytoplankton abundance and nutrient concentrations were not directly correlated, the scales of variability were clearly similar. (Auth.)

J-49547

Ohshima, K.I., et al, **Seasonal variations in ocean structure and current in Ongul Strait, Antarctica, in 1991**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1993, p.51-59, 12 refs.

Ocean structure and current were observed below fast ice in Ongul Sound over a nearly full annual cycle in 1991. In the fall, fresh, cold and oxygen-rich water accumulated in the upper layer. This water is diffused

or mixed with the lower layer gradually in winter. From spring to summer, warm, saline and oxygen-poor water appears in the mid-depth and deep layers. These features seem to be common every year. Horizontal oceanic advection is dominant in the heat and salt budget. In spite of no direct wind forcing and negligible thermohaline forcing, the current in Ongul Strait is found to be strong, with a typical velocity of 0.3 m/s. The strong current is confined to the upper 100-300 m from the surface. The direction of the mean current changes drastically from southward to northward in May. (Auth.)

J-49548

Nagata, Y., Kawamiya, M., Michida, Y., Odamaki, M., **Seasonal variations of the sea level at Syowa Station, Antarctica**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1993, p.60-72, 9 refs.

The sea level record at Showa Station from 1979 to 1988 is analyzed, and seasonal variations of sea level are investigated. The sea level reaches a maximum in early winter and falls to its minimum in mid-summer. The variation shape is very skewed, with flat winter peaks and sharp summer troughs. The ascending rate of sea level in the fall is much greater than the descending rate in spring. The correlation of sea level change with several oceanographic and meteorological phenomena is discussed, and several possible mechanisms are reviewed. (Auth.)

J-49560

Ferguson, E.M., Klein, E.M., **Fresh basalts from the Pacific-Antarctic Ridge extend the Pacific geochemical province**, *Nature*, Nov. 25, 1993, 366(6453), p.330-333, 28 refs.

The juxtaposition of Indian Ocean basalt compositions west of the Australian-Antarctic Discordance (AAD) and Pacific compositions to the east suggests that the AAD may overlie a zone of convergence between ocean-basin-scale upper-mantle convection regimes; if this is so, Pacific isotope compositions should occur continuously along the length of the Pacific-Antarctic Ridge (PAR). Fresh basaltic glasses have now been recovered from the southernmost portion of this previously unsampled ridge axis, and the authors report their major element, trace element and isotopic compositions. The chemical systematics of these rocks suggest that the Pacific Ocean geochemical province includes the PAR, extends to the AAD south of Australia, and thus is one of the largest chemically coherent mantle domains on the Earth.

J-49566

Gordon, A.L., Huber, B.A., Hellmer, H.H., Field, A., **Deep and bottom water of the Weddell Sea's western rim**, *Science*, Oct. 1, 1993, 262(5130), p.95-97, 19 refs.

Oceanographic observations from the Ice Station Weddell 1 show that the western rim of the Weddell Gyre contributes to Weddell Sea Bottom Water. A thin (<300 m), highly oxygenated benthic layer is composed of a low-salinity type of bottom water overlying a high-salinity component. This complex layering disappears near 66S because of vertical mixing and further inflow from the continental margin. The bottom water flowing out of the western rim is a blend of the two types. Additionally, the data show that a narrow band of warmer Weddell Deep Water hugged the continental margin as it flowed into the western rim, providing the continental margin with the salt required for bottom-water production. (Auth.)

J-49607

Gurgul, H., **Description of quantity and dispersion distribution changes of mineral suspensions occurring in the Ezcurra Inlet waters, King George Island within a year cycle**, *Korean journal of polar research*, June 1993, 4(1), p.3-14, 17 refs.

Monthly measurements of mineral suspensions present in waters of the Ezcurra Inlet, taken during one year, showed the highest values in Mar., in the surface- to 2 m depth layer. The lowest values were obtained in Nov. (1 billion pieces/cu m). The greatest quantity changes occurred in the first 20 m of depth, the number of suspensions depending on the distance from shore, water depth and meteorological and hydrodynamic conditions. Results of suspension dispersion distribution analysis are discussed and presented in graphs.

J-49609

Kim, K.H., Moon, J.W., Lee, K.Y., **Paleoceanographic evolution of subantarctic South Atlantic**, *Korean journal of polar research*, June 1993, 4(1), p.25-37, Refs. p.34-37.

A paleoenvironmental study of the South Atlantic Ocean, based on the occurrence of radiolarians collected during the Ocean Drilling Program (ODP) Leg 114, is reported. The thick and relatively complete Paleogene sequences (65-24 Myr) from ODP Leg 114 cores provide an unparalleled opportunity to describe a Paleogene oceanographic evolution for the high-latitude southern ocean. Three major periods of climatic and paleoceanographic evolution are recognized: the Early/Middle Eocene boundary, the Eocene/Oligocene boundary, and the late Early Oligocene. (Auth. mod.)

J-49625

Gordon, A.L., Ice Station Weddell Group of Principal Investigators and Chief Scientists, **Weddell Sea exploration from Ice Station**, *Eos*, Mar. 16, 1993, 74(11), p.124-126, 16 refs.

This paper describes objectives and activities of the first international scientific southern ocean ice drift station, Ice Station Weddell-1 (ISW-1), established in 1992 in the western Weddell Sea by a joint effort of the United States and Russia. Included in the station's research program were measurements of thermohaline and tracer fields, currents, and turbulent fluxes within the oceanic and atmospheric planetary boundary layers; the study of the physical, chemical, and biological characteristics of sea ice; sea-ice dynamics; and water column biology. U.S. and Russian science programs complemented each other to yield a more complete picture of the environment. Observations were made at the ISW-1 site and from remote instrumented drifters, helicopters, and ships associated with the various phases of the work. (Auth. mod.)

J-49635

Goeyens, L., Dehairs, F., **Seasonal fluctuation of export and recycled production in different subareas of the southern ocean**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.1, Brussels, Belgian Science Policy Office, 1993, 79p., Refs. p.71-79.

This study emphasizes the specific effects of nitrogenous nutrients on the origin, development and fate of primary production in the southern ocean. The inherent consequences of nitrogen utilization by phytoplankton for the channelling of organic nitrogen towards *in-situ* regeneration or towards sedimentation are investigated. Nitrate depletion, the indication of the overall new production during the ongoing season, ranged from near zero to very high values (over 1000 mmol N/sq m). As a general trend, nitrate depletions were lowest in the closed pack ice zones, while strongly enhanced nitrate removal was observed in the marginal ice zone of the Scotia-Weddell Confluence area and in the continental shelf zone near Amery Ice Shelf in Prydz Bay. The results obtained during different antarctic cruises provide clear evidence for a distinction between different antarctic ecosystems. Intensive new production, characteristic for fertile zones bordering the retreating ice edge, was mainly conveyed towards the regenerating microbial network. This was mirrored by enhanced ammonium availability and poor subsurface barite accumulation. On the other hand, the moderate to low primary production of open sea and close pack ice zones was available for export and only small amounts of the organic matter were remineralized in the upper layer. (Auth. mod.)

J-49636

Joiris, C., Holsbeek, L., **Ecotoxicology of stable pollutants in antarctic marine ecosystems: mercury and organochlorines**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto.

Vol.1, Brussels, Belgian Science Policy Office, 1993, 33p., Refs. p.31-33.

In the Antarctic, data were gathered on heavy metals (total and organic (methyl) mercury), and organochlorines (pesticides and PCBs) showing that the antarctic marine systems are about 6 times less contaminated than in the North Sea. The high concentrations per unit weight result from much lower biomasses in the Antarctic: the total load of basically water insoluble residues is almost entirely distributed on fewer particles, leading to a higher load per particle. This relatively low ecosystem load, the high concentration on the particulate matter, allows one to detect the main transfer mechanisms of the contaminants to the higher trophic levels: if the higher trophic levels, e.g. fish, were mainly indirectly contaminated through their food, high levels of mercury and organochlorines were to be expected. The obtained results show, on the contrary, that contamination levels in the Antarctic are much lower than in the North Sea. This clearly shows the importance of direct contamination from the water to the fish, a confirmation of experimental data. Seabirds being indirectly contaminated from these fish also present low levels of pollutants, compared with North Sea data. (Auth. mod.)

J-49637

Bouquegneau, J.M., Joiris, C., **CO₂ and O₂ in antarctic marine ecosystems**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.1, Brussels, Belgian Science Policy Office, 1993, 17p., Refs. p.15-17.

In Oct. and Nov. 1988, photosynthetic oxygen production at the ice edge in the northwestern Weddell Sea was far in excess of plankton community respiration. The net oxygen evolution rate that was measured was high enough to explain the oxygen saturation values that were recorded. However, in the ice-covered area to the south, respiration dominated—a cause of the low oxygen concentration recorded in that region as important as upwelling of oxygen-poor water. The oxygen production and consumption rates of the plankton were compatible with carbon dioxide concentrations registered at the ice edge underneath the pack-ice: one mole of oxygen for each mole of carbon dioxide, as expected on the basis of the 1 to 1 ratio in the simplest photosynthesis-respiration equations. The relation between photosynthetic oxygen evolution and carbon dioxide consumption on the one hand, and heterotrophic consumption and release on the other, underline the importance of the activity of the microbial ecosystem (phytoplankton and microheterotrophs) in determining the concentration of these gases in both the ice-free and ice-covered southern ocean. (Auth.)

J-49641

Fettweis, M., Yu, C.H., Berlamont, J., **Numerical simulations of wind-driven flows in the antarctic coastal zones**, Belgian scientific research programme on the Antarctic. Scientific results of Phase Two (10/1988-05/1992). Edited by S. Caschetto. Vol.3, Brussels, Belgian Science Policy Office, 1993, 54p., Refs. p.52-54.

This paper gives a summary of the results obtained during a study of simulation of ocean circulation in the coastal zones. Two hydrodynamic numerical models are presented. The first consists of a 2.5D baroclinic model, and the second of a 3D barotropic model. The 2.5D model solves the 3D hydrodynamic equations on a vertical plane; the derivatives perpendicular to the plane are considered to be zero. Both models are explicit in time and make use of the MAC method to solve the equations. The 2.5D model is used to calculate the influence of stratification on the wind-induced currents on the continental shelf and the shelf break in presence of an ice cover, and to simulate the currents off the Adélie Coast forced by a katabatic wind. The 3D model has been applied to a coastal area at Terra Nova Bay. The ocean is again forced by a katabatic wind. It is interesting to note that the surface flow calculated by both models is in agreement with the theory of coastal polynya formation. (Auth.)

J-49654

Speer, K.G., Zenk, W., **Flow of Antarctic Bottom Water into the Brazil Basin**, *Journal of physical oceanography*, Dec. 1993, 23(12), p.2667-2682, 20 refs.

The total transport of Antarctic Bottom Water across the Rio Grande Rise, including the western boundary, the Vema Channel, and the Hunter Channel is estimated from hydrographic measurements across these pathways. The contribution of the Vema Channel is greatest at $3.9 \times 10^6 \text{ m}^3/\text{s}$, which is very close to earlier estimates. The western boundary current contribution is $2.0 \times 10^6 \text{ m}^3/\text{s}$ and that of the Hunter Channel $0.7 \times 10^6 \text{ m}^3/\text{s}$. The lower values outside the Vema Channel are offset by the important source of mass they form to the lower density classes of bottom water. About 40% of the flow is concentrated in the highest density class representing the source of Weddell Sea Deep Water to the Brazil Basin. The flow structure is characterized by horizontal and vertical recirculation. (Auth. mod.)

J-49660

Gersonde, R., ed, **Expedition ANTARKTIS X/5 of RV *Polarstern* in 1992** [Die Expedition ANTARKTIS X/5 mit FS *Polarstern* in 1992], *Berichte zur Polarforschung*, 1993, No.131, 167p., In German and English with summary and itinerary in English. 57 refs.

Expedition ANT-X/5 was the first geoscientific and hydrographic oriented expedition with RV *Polarstern* to the Scotia Sea and adjacent areas. The cruise was carried out during southern winter (Aug. 8-Sep. 26, 1992) and hence about 2000 nm of the ca. 6000 nm long cruise track from Puerto Madryn to Punta Arenas was in dense pack ice at temporarily extremely low air temperatures. Despite this, large amounts of data and samples were collected. Expedition ANT-X/5 focused on a marine geologic survey. Sampling programs were carried out on five transects in the southern Argentine Basin, the East Georgia Basin, east of the South Sandwich Trench, in the Scotia Sea, and the eastern Drake Passage. This region of the southern ocean is characterized by complex bottom topography with deep sea channels and trenches, and ridge systems. Similarly, the hydrographic pattern, which at least in some regions is controlled by the sea floor topography, is also rather complex. The western section of the Atlantic southern ocean is known as the major outflow region of cold antarctic bottom waters where the oceanic frontal systems show distinct loops and merge together in some areas. (Auth. mod.)

J-49676

Roether, W., et al, **Chlorofluoromethane and hydrographic section across Drake Passage: deep water ventilation and meridional property transport**, *Journal of geophysical research*, Aug. 15, 1993, 98(C8), p.14,423-14,435, 34 refs.

The chlorofluoromethanes CFM 11 and CFM 12 were measured in Drake Passage for the first time. CFM concentrations decreased from the surface down into the Upper Circumpolar Deep Water, for which they confirm water renewal from the south. For the Lower Circumpolar Deep Water, in which CFM concentrations were above detection threshold only south of the Polar Front, very little water renewal on the CFM time scale is implied. Nonvanishing CFM is again found in the Weddell Sea Deep Water and the Southeast Pacific Deep Water toward the bottom in the south, but recent ventilation for the latter water mass is rejected. CFM 11 and CFM 12 concentrations vary essentially in constant proportion to low concentration, bringing into question the possibility of using CFM ratios as "age" markers. The observed ratios are a natural feature of the upwelling regime of the southern ocean. Property concentrations on isopycnal surfaces display large undulations, reaching into the Upper Circumpolar Deep Water. Their extrema are situated at the boundaries of the current bands of the Antarctic Circumpolar Current. The feature is ascribed to property advection by rings, and is taken to support previous claims that rings are an important transport mechanism across the Antarctic Circumpolar Current and that they might assist in maintaining its fronts. (Auth. mod.)

J-49679

Barrett, P.J., ed, Davey, F.J., ed, **Antarctic stratigraphic drilling, Cape Roberts project, Workshop report**, The Royal Society of New Zealand, Miscellaneous Series No. 23, Wellington, Royal Society of New Zealand, 1992, 38p., For individual papers see A-49686, B-49685, E-49680, E-49681, F-49682, G-49683, G-49684 or 48-2320 through 48-2324.

In this project it is proposed to investigate antarctic glacial and tectonic history for the period from 36 million to more than 100 million years ago, by coring continuously a 1500+ m sequence exposed off Cape Roberts in the SW corner of the Ross Sea. The cores and related seismic data will enable the investigation of a range of problems in late Cretaceous-early Cenozoic history. These include tectonic evolution of the region and its relation to the southwest Pacific, and the climatic and depositional history of the region, of global interest because of its polar location over this period. Major questions to be addressed by the project include the following: the formation of the West Antarctica rift system; the interrelationships of the TAM uplift history with igneous activity and plate movements of the southwest Pacific; ice cover over Antarctica; and the effect of geographic and climatic changes on antarctic biota.

J-49708

Kaczmarek, I., Barbrick, N.E., Ehrman, J.M., Cant, G.P., ***Eucampia* Index as an indicator of the Late Pleistocene oscillations of the winter sea-ice extent at the ODP Leg 119 Site 745B at the Kerguelen Plateau**, *Hydrobiologia*, Oct. 29, 1993, Vols.269/270, p.103-112, 60 refs.

A new paleoenvironmental proxy, *Eucampia* Index, was used to trace the Late Pleistocene oscillations of winter ice extent at ODP Leg 119, Site 745B (59.6S/85.9E) on the Kerguelen Plateau. The index is calculated as the ratio of winter terminal to intercalary valves of the diatom *Eucampia antarctica* sensu lat. During the early Brunhes the winter sea-ice edge was positioned south from Site 745. It started expanding northward, closer to the site location soon after 0.4 Myr and progressed in a manner of several wide oscillations. For approximately the last 0.1 Myr the winter sea-ice edge oscillated less and retained a similar range of oscillations. The ice edge oscillated in periods which correspond closely to that of Milankovitch oscillations of Earth obliquity, although the significance of individual periods appears to vary in time. (Auth.)

J-49713

Nedwell, D.B., Walker, T.R., Ellis-Evans, J.C., Clarke, A., **Measurements of seasonal rates and annual budgets of organic carbon fluxes in an antarctic coastal environment at Signy Island, South Orkney Islands, suggest a broad balance between production and decomposition**, *Applied and environmental microbiology*, Dec. 1993, 59(12), p.3989-3995, 30 refs.

Reported here is the first comprehensive seasonal study of benthic microbial activity in an antarctic coastal environment. Measurements were made from Dec. 1990 to Feb. 1992 of oxygen uptake and sulfate reduction by inshore coastal sediments at Signy I. From these measurements the rate of benthic mineralization of organic matter was calculated. In addition, both the deposition rate of organic matter to the bottom sediment and the organic carbon content of the bottom sediment were measured during the same period. Organic matter input to the sediment was small under winter ice cover, and the benthic respiratory activity and the organic content of the surface sediment declined during this period as available organic matter was depleted. On an annual basis, about 32% of benthic organic matter mineralization was anoxic, but the proportion of anoxic compared with oxic mineralization increased during the winter as organic matter was increasingly buried by the amphipod infauna. Fresh organic input occurred as the sea ice melted and ice algae biomass sedimented onto the bottom, and input was sustained during the spring after ice breakup by continued primary production in the water column. The benthic respiratory rate and benthic organic matter content correspondingly increased towards the end of winter with the input of this fresh organic matter. (Auth. mod.)

J-49715

Thompson, S.R., **Estimation of the transport of heat in the southern ocean using a fine-resolution numerical model**, *Journal of physical oceanography*, Nov. 1993, 23(11), p.2493-2497, 11 refs.

Results from a numerical model of the southern ocean (the U.K. Fine-Resolution Antarctic Model) have been used to repeat the calculations of De Szoeke and Levine, who used hydrographic data to estimate the advective heat transport across a circumpolar path of constant vertically averaged temperature. The results from the model suggest that the mean flow is responsible for only a small proportion of the heat transport and that the

main process carrying heat poleward across such a path is in fact eddy heat transport. A comparison is made with the heat transport across constant latitude circles. Although the mean flow, consisting of large-scale meanderings of the Antarctic Circumpolar Current across the latitude circle, plays a more important role in this case, there is good correspondence between total heat transports across contours of constant vertically averaged temperature and those across constant latitude circles. Diffusive fluxes, in part representing subgrid-scale processes, also play an important role in the model, with such fluxes complementing the advective eddy heat transport. (Auth.)

J-49788

McPhee, M.G., Martinson, D.G., **Turbulent mixing under drifting pack ice in the Weddell Sea**, *Science*, Jan. 14, 1994, 263(5144), p.218-221, 28 refs.

By providing cold, dense water that sinks and mixes to fill the abyssal world ocean, high-latitude air-sea-ice interaction is the main conduit through which the deep ocean connects with the rest of the climate system. A key element in modeling and predicting oceanic impact on climate is understanding the processes that control the near-surface exchange of heat, salt, and momentum. In 1992, the United States-Russian Ice Station Weddell-1 traversed the western Weddell Sea during the onset of winter, providing a platform for direct measurement of turbulent heat flux and Reynolds stress in the upper ocean. Data from a storm early in the drift indicated well-formed Ekman spirals (in both velocity and turbulent stress); high correlation between mixed layer heat flux and temperature gradients; that eddy viscosity and eddy thermal diffusivity were similar, about 0.02 sq m/s; and that the significant turbulent length scale (2 to 3 m through most of the boundary layer) was proportional to the wavelength at the peak in the weighted vertical velocity spectrum. The measurements were consistent with a simple model in which the bulk eddy viscosity in the neutrally buoyant mixed layer is proportional to kinematic boundary stress divided by the Coriolis parameter. (Auth. mod.)

J-49792

Lukashina, N.P., **Present-day solution of calcium carbonate in the tropical zone of the Atlantic according to results of foraminifera analysis**, *Oceanology*, Dec. 1992, 32(3), p.370-374, Translated from *Okeanologiya*. 22 refs.

The purpose of this article is to trace the effect of antarctic bottom water on carbonate material by the solution of planktic foraminifera tests. Thirty-seven samples of Recent bottom sediments from the depths of 2020 to 6120 m in the North American and Canaries basins were studied. The degree of solution of the carbonate material was established by the ratio of whole to partly destroyed planktic foraminifera tests in these sediments. The specific composition of the benthic foraminifera communities reveal the distribution of this water mass in the region under study. As a result, it was established that the solution of the carbonate material is associated with antarctic bottom water only in the region of the Mid-Atlantic ridge and adjacent parts of the neighboring abyssal basins. But in the more western and eastern parts of the region, the solution of CaCO_3 is largely related to the elevated contents of organic matter in the sediment, the oxidation of which produces an environment that is aggressive to calcium carbonate. (Auth. mod.)

J-49882

Roese, M., et al, **Coastal oceanography and geology of Half Moon I.** [Aspectos oceanográficos y geológicos costeros de isla Media Luna, Antártida], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1993, No.414, 24p., In Spanish with English and German summaries. 22 refs.

During the 1988-1990 summer seasons, a program was carried out on Half Moon I. with the objective of determining water dynamics in coastal areas and the geomorphological and sedimentary response of the littoral zone. Circulation patterns, tidal activity, and current and wind measurements are discussed and presented in graphs and tables. On the eastern coast of the island, the refraction effect produces 3 areas of maximum wave energy, reaching a height of 3 m at the NE and SE extremes of the island and on the southern coast of Menguante Cove. The marked tilt at the bottom of the western coast of the island allows the access of ice debris contributed by the glaciers of Livingston I. and driven by the westerly

winds, and together with the calculated 0.8 m high waves they originate the erosive features that are more evident here than on the eastern coast. (Auth. mod.)

J-49969

Döös, K., Webb, D.J., **Deacon cell and other meridional cells of the southern ocean**, *Journal of physical oceanography*, Feb. 1994, 24(2), p.429-442, 20 refs.

The meridional circulation cells of the southern ocean are investigated using the results from a fine-resolution primitive equation model. Zonal integration along depth levels shows the classical series of meridional cells but integration along density layers shows a number of differences, including the virtual disappearance of the Deacon cell. To investigate the differences, the meridional transport is calculated as a function of both density and depth. The results show that the Deacon cell is associated with systematic changes in the depth of density surfaces between the western boundary current region off South America and the return flow in the interior of the ocean. Water flowing on each density surface produces a meridional cell with a vertical excursion of a few hundred meters. These cells combine, without water crossing density surfaces, to produce a single integrated Deacon cell extending from the surface to below 2000 m. The results also show that, at each latitude, water on each of the density surfaces in the upper layers of the ocean systematically transfers angular momentum from the shallowest depths at which it is found to deeper depths. (Auth. mod.)

J-49983

Nicholls, K.W., Jenkins, A., **Temperature and salinity beneath Ronne Ice Shelf, Antarctica**, *Journal of geophysical research*, Dec. 15, 1993, 98(C12), p.22,553-22,568, 35 refs.

Salinity and temperature measurements were made beneath Ronne Ice Shelf. Access to the seawater was gained by hot-water drilling through 562 m of ice at a site 300 km from the ice front. The ice column is composed of 516 m of meteoric-origin ice, underlain by 31 m of consolidated saline ice, with a further 15 m of unconsolidated slush at the base. The 360-m deep water column beneath the ice shelf consists broadly of a 210 m layer of Ice Shelf Water (ISW) at a potential temperature of -2.30 C and salinity 34.53, overlying a 100-m thick layer of modified Western Shelf Water (-2.03 C, 34.64). The layers are separated by a weak 50-m thick pycnocline. Comparison of the data with published oceanographic observations from the shore lead indicate that the source of the water is either the western Berkner shelf or north of the ice front in the Ronne Depression. With the exception of the upper few tens of meters, the temperature and salinity of the entire water column vary by about 0.04 C and 0.03 on tidal timescales, and there is evidence for a longer-term drift, presumably connected with shifts in the larger-scale circulation. The salinity and deuterium budgets indicate that the meltwater fraction in the ISW observed at the drill site was between 5.3 and 6.5 per mill, in reasonable agreement with values previously found for ISW in the open ocean. (Auth.)

J-49987

Kang, D.J., et al, **Oxygen-18 and nutrients in the surface waters of the Bransfield Strait, Antarctica during austral summer 1990/91**, *Korea Ocean Research and Development Institute. Collected reprints*, 1992 (Pub. 1993), Vol.9, p.591-599, Reprinted from *Journal of the Oceanological Society of Korea*, Sep. 1992, Vol.27, No.3, p.250-258. With Korean summary. 21 refs.

The oxygen isotope composition of surface waters in the Bransfield Strait was determined as one extra state variable in order to characterize water masses in the region, since salinity is significantly modified due to the freezing and ice melting in this polar region. The salinity, temperature, and $\delta^{18}\text{O}$ values vary from 34.0 to 34.5 per mill, -0.5 to 2.1 C and -0.50 to -0.26 per mill, respectively. The combined effects of evaporation, precipitation, freezing, and ice melting are reflected in the widely scattered data. Although it is small, the distribution of $\delta^{18}\text{O}$ in the Bransfield Strait is strongly affected by the freezing-ice melting rather than by evaporation-precipitation. The ice-melted fresh water which has higher temperature, depleted salinity and nutrients may be injected into Bransfield Strait from the north. The concentrations of nutrients decrease gradually from north to south. The waters were characterized by two groups of higher (about 19.4) and lower N/P ratio (about 16.7). The lower N/P ratio is found in the northern part where ice-melted fresh water is injected, and the higher N/P ratio is found in the southern part of Bransfield Strait.

Although more precise work is needed, the difference of N/P ratio can be an evidence of the ice-melted water injection into Bransfield Strait. Chlorophyll *a* concentrations, in general, increase from northwest (Weddell Sea) to the southeast (Smith and Hosseon Is.). Probably the injection of nutrient-depleted fresh water from the ice melting reduces the chlorophyll *a* concentration. (Auth.)

J-49993

Hyland, J., et al, **Effects of an oil spill on the soft-bottom macrofauna of Arthur Harbour, Antarctica compared with long-term natural change**, *Antarctic science*, Mar. 1994, 6(1), p.37-44, 14 refs.

The macroinfauna at depths of 30-115 m was sampled in Mar.-Apr. 1989, c. 2 months after an oil spill that resulted from the grounding of the *Bahia Paraiso*. Stations consisted of the oil-spill site and a comparable control location, and 2 historical sites previously sampled in 1971. There were no significant differences ($P < 0.05$) between the oil-spill and control sites in numbers of individuals, species, or families; nor were there any major differences in dominant fauna or overall community composition. The absence of a detectable impact on the fauna is consistent with results of hydrocarbon analyses, which showed that subtidal sediments were nearly devoid of contamination emanating from the *Bahia Paraiso*. The assemblage at the shallower of the two historical sites, however, showed a substantial change over the 18-yr period between studies. This change consisted of a shift toward a more species-rich and abundant macroinfauna characteristic of the more physically stable parts of the harbor. This change maybe related to the fact that the glacier face near the site has retreated c. 250 m over the last 20 yrs, resulting in less physical disturbance of the adjacent seafloor. (Auth. mod.)

J-50048

Mikolajewicz, U., Maier-Reimer, E., Crowley, T.J., Kim, K. Y., **Effect of Drake and Panamanian gateways on the circulation of an ocean model**, *Paleoceanography*, Aug. 1993, 8(4), p.409-426, 65 refs.

Geologic studies indicate that prior to 40 Ma the Drake Passage was closed and the Central American Isthmus was open. The effect of these changes has been examined in an ocean general circulation model. In the first experiment, the only change involved closure of the Drake Passage. The net effect was decreased transport of the Antarctic Current and an approximate fourfold increase in outflow of antarctic deep-bottom waters. The very large increase in antarctic outflow suppresses North Atlantic Deep Water (NADW) formation. A more geologically realistic closed Drake/open central American isthmus experiment reduces antarctic outflow about 20% below the first experiment. A third experiment involved an open Drake and open Central American isthmus. In this experiment, antarctic outflow is diminished to slightly above present levels but NADW production is still low due to free exchange of low-salinity surface water between the North Pacific and North Atlantic. Finally, simulations with an energy balance model demonstrate that the changes in surface heat flux south of 60S due to breaching of the Drake barrier do not result in temperature changes large enough to have triggered antarctic glaciation. These results lend further support to the concept that variations in the geometry of the ocean basins can significantly influence ocean circulation patterns and the sediment record. (Auth. mod.)

J-50051

Pak, D.K., Miller, K.G., **Paleocene to Eocene benthic foraminiferal isotopes and assemblages: implications for deepwater circulation**, *Paleoceanography*, Aug. 1992, 7(4), p.405-422, 56 refs.

General Circulation Model results indicate that deepwater source regions may be highly sensitive to changing basin configurations. To decipher deepwater changes, detailed benthic foraminiferal faunal and isotopic records of the late Paleocene through the early Eocene (60 to 50 Ma) were examined from two critical regions in the North Atlantic and the Pacific and compared with published data from the southern ocean. A dramatic negative excursion in both carbon and oxygen isotopes occurred in the latest Paleocene in the southern ocean. This is a short-term (<100 kyr) globally synchronous event which also is apparent in both the Atlantic and Pacific records as a carbon isotopic excursion of approximately 1 per mill. It is speculated that the southern ocean deepwater source was reduced or eliminated at the time of the excursion. During the early Eocene, southern

ocean $\delta^{13}\text{C}$ values remained enriched relative to the North Atlantic and Pacific. However, the southern ocean was also enriched in $\delta^{18}\text{O}$ relative to these basins. These patterns indicate that although the southern ocean was proximal to a source of cool, nutrient-depleted water, the intermediate to upper deep water sites of the North Atlantic and Pacific were ventilated by a different source that probably originated in low latitudes, i.e., WSDW. (Auth. mod.)

J-50052

Crowley, T.J., **North Atlantic deep water cools the Southern Hemisphere**, *Paleoceanography*, Aug. 1992, 7(4), p.489-497, 54 refs.

It is suggested that the "NADW-Antarctic" connection may work opposite to that conjectured by many investigators; that is, when NADW production rates are high, Southern Hemisphere temperatures decrease rather than increase. The revised interpretation is consistent with observations and ocean modeling studies which demonstrate that a second and more important negative feedback is also operating. In order to conserve volume, southward export of NADW across the equator is accompanied by import of an equivalent volume of considerably warmer water from shallower oceanic layers in the South Atlantic. The Southern Hemisphere loses heat as a result of this exchange. It is suggested that this more comprehensive view of the role of NADW may explain both decadal-scale variations in South Atlantic sea surface temperatures in this century and two significant problems in Pleistocene climatology: why Southern Hemisphere temperatures decreased before CO_2 levels decreased at the end of the last interglacial, and why Southern Hemisphere temperature changes precede changes in Northern Hemisphere ice volume. The estimated magnitude of altered Southern Hemisphere heat export is comparable to the ice-age CO_2 signal and may be able to account for the observed cooling even when CO_2 levels were high. When cast into a frequency domain framework, this interpretation may also help explain why Southern Hemisphere temperatures lead global ice volume changes. (Auth. mod.)

J-50057

Gallardo, V.A., ed, Ferretti, O., ed, Moyano, H.I., ed, **International Seminar on Oceanography in Antarctica**, Concepción, Chile, Mar. 7-9, 1991, **International Seminar on Oceanography in Antarctica. Proceedings** [Oceanografia in Antartide. Atti Seminario Internazionale. Oceanografía en Antártica. Actas Seminario Internacional], Concepción, ENEA—Centro EULA—Chile, 1992, 545p., Cover page in Italian and Spanish. Articles in Italian, Spanish or English. Refs. passim. For selected papers see A-50104, B-50065, B-50066, B-50072 through B-50100, B-50102, B-50103, E-50069, E-50101, J-50058 through J-50064, J-50067, J-50068, J-50070 and J-50071.

This is a collection of papers presented by Italian, Chilean, Argentine, Belgian, French, German and U.S. scientists at the International Seminar on Oceanography in Antarctica, held Mar. 7-9, 1991, in Concepción, Chile. It consists of about 50 reports—dealing mainly with the physical, chemical, biological and geological oceanography—resulting from the most recent Italian and Chilean scientific investigations in antarctic and subantarctic regions.

J-50058

Stocchino, C., **Italian physical oceanography studies in 1986-1990** [Attività svolta dall'Italia nel campo dell'oceanografia fisica in Antartide nel periodo 1986-1990], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.13-20, In Italian with English and Spanish summaries. 7 refs.

Physical oceanography investigations carried out in Terra Nova Bay and the adjacent waters of the Ross Sea between 1986 and 1990 are discussed. On a larger scale, CTD measurements obtained in the Pacific sector of the Antarctic yielded some peculiarities of water masses and the spatial variability of marine dynamics. Current meter measurements were used to define the temporal variability of circulation and some of the possible mechanisms forcing it. (Auth. mod.)

J-50059

Angricano, G., **Activity of the Naval Hydrographic Institute**

during the Italian antarctic expeditions of 1986-1990 [Attività idrografica svolta dall'Istituto Idrografico della Marina durante le spedizioni italiane in Antartide 1986-1990], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.21-31, In Italian with English and Spanish summaries.

For the first time, the Italian Hydrographic Institute (I.I.M.) has planned and conducted a systematic survey in Antarctica with the aim of producing two bathymetric charts, one on a 1:100,000 scale and the other on a 1:50,000 scale, in order to provide suitable cartographic support to other scientific research. Geodetic and topographic operations were conducted using GPS receivers and "total stations". Several platforms and various echosounders were used for bathymetric measurements in ice-free areas and ice-covered bays. Results of each survey, and the evaluation of platforms and equipment used, are given. Thus far, 80% of the area assigned has been surveyed. The remaining 20%, which is partially covered by ice, will probably be completed in 1992. The two charts already published are available at the I.I.M. (Auth.)

J-50060

Artegiani, A., Paschini, E., **Oceanographic conditions in the South Pacific Ocean during the summer of 1989-1990** [Condizioni oceanografiche nel settore neo-zelandese dell'oceano antartico durante l'estate australe 1989-90], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.33-38, In Italian with English and Spanish summaries. 13 refs.

Data obtained on the R/V *Cariboo* during the 5th Italian Antarctic Expedition, Nov. 20, 1989-Feb. 6, 1990, are presented. The area investigated extends from the Campbell Plateau to the Ross Sea continental shelf and, following the 75th parallel south, from the external margin of the Ross Sea to Terra Nova Bay. The water masses in the studied area are well characterized. On the Ross continental shelf, an upwelling of the circumpolar deep water is evident. The authors found that the first baroclinic mode has a dimension of approximately 4.4 km, meaning that the Ross Sea area is affected by dynamical structures with very small spatial scales. (Auth. mod.)

J-50061

Stocchino, C., Manzella, G.M.R., **Current circulation in Terra Nova Bay** [La circolazione delle correnti a Baia Terra Nova (Mare di Ross-Antartide)], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.39-40, In Italian with English and Spanish summaries.

Analysis of hydrographic and current-meter data from Terra Nova Bay allowed the authors to define the high spatial and temporal variability of marine dynamics in the area. The internal radius of deformation is too small (2-3 km) for a synoptic observation from ships. Tidal movements (associated mainly with the diurnal component) and the wind driven motion are found to be very significant. The convective phenomena create a temperature minimum at depth. (Auth.)

J-50062

Nelson, D.M., **Biogeochemical cycles of organic and siliceous matter in the southern ocean**, International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.43-57, With Italian and Spanish summaries. Refs. p.54-57.

The southern ocean sustains large (and in some cases increasing) populations of carnivorous marine life and high accumulation rates of siliceous sediments in spite of low annual primary productivity. This situation implies that the cycles of both organic and siliceous biogenic material in the southern ocean must differ significantly from what they are in other oceanic systems. Some of these differences have now been identified, and include the following: relative uptake of new nutrients by the phytoplankton varies little with total productivity in the southern ocean; the *f* ratio (ratio of nitrate uptake to the sum of nitrate and ammonium uptake) is typically about 0.5, with the result that areas of low to moderate primary productivity can export much more organic matter to the upper trophic levels and to the deep ocean than is the case at lower latitudes; bac-

teria are generally less abundant numerically in southern ocean surface waters than they are in temperate and tropical surface waters having the same chlorophyll content, which implies that a lower fraction of the primary production is consumed by bacteria; the specific dissolution rate of biogenic silica tends to be substantially lower in southern ocean surface waters than in temperate and tropical systems, possibly as a direct consequence of low surface-layer temperature; this results in a decoupling of the cycles of organic and siliceous matter within the water column and the delivery of an unusually high fraction of the surface-produced silica to the seabed; and the quantitative importance of phytoplankton blooms in the marginal ice zone, and perhaps other mesoscale high-productivity events, in the overall carbon and silica budgets of the southern ocean is considerable. (Auth. mod.)

J-50063

Catalano, G., **Activities of the chemical oceanography group within the Italian antarctic expeditions** [L'attività del gruppo di oceanografia chimica nell'ambito delle campagne oceanografiche italiane in Antartide], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.59-70, In Italian with English and Spanish summaries. 14 refs.

Activities of the chemical oceanography group participating in the 1987-88 and 1989-90 Italian antarctic expeditions are discussed. Three regions were investigated: the Terra Nova Bay, the northwest Ross Sea, and the oceanic area east of the Balleny Is. Some results are shown which are characteristics of 4 typical antarctic situations: an oceanic zone, the Ross Sea continental shelf, a marginal-ice zone, and a coastal zone. In the oceanic situation, variations of nutrients and apparent oxygen utilization (AOU) are clearly evident and mark the crossing of the Antarctic Polar Front and the Ross continental slope. In the Ross Sea, the effects of thermohaline processes and bottom topography on the chemical characteristics of the sub-surface water, studied along the E-W transect at 75S, are shown in a decrease of nutrients, AOU and total inorganic carbon in surface water. At Terra Nova Bay, a comparison between data collected during the two cruises shows that the Gerlache Inlet differs from the rest of the Bay in its higher assimilation of nutrients and production of dissolved oxygen. This characteristic is coupled to high temperature (2 C) of the sea surface and to low salinity. (Auth. mod.)

J-50064

Silva, N., **Chilean chemical oceanographic research in antarctic and subantarctic regions** [Estado actual y algunas perspectivas en la investigación oceanográfica química, efectuada por investigadores chilenos en las zonas antártica y subantártica], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.71-74, In Spanish with English and Italian summaries. 4 refs.

Three oceanographic investigations, carried out by the Chilean Antarctic Institute and through participation in the BIOMASS Program in waters surrounding the South Shetland Is., and one carried out in the subantarctic zone, are described.

J-50067

Becerra, J., et al, **Pesticides and hydrocarbons in the Drake Passage, Bransfield Strait and the South Shetlands** [Pesticidas organoclorados e hidrocarburos derivados del petróleo en el Paso Drake, Estrecho Bransfield e Islas Shetland del Sur], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p.107-115, In Spanish with English and Italian summaries. 12 refs.

Samples of sea water, sediments and organisms were analyzed at 33 stations by gas-liquid chromatography to determine hydrocarbons and organochlorinated pesticide concentrations in the Drake Passage, Bransfield Strait and the South Shetland Is. The levels found in water were from undetectable to 0.853 ng/l of DDT. In sediments, DDT level reached 1.352 ng/g and in organisms 7.820 ng/g. The hydrocarbon concentrations ranged from undetectable to 19 ng/l in seawater and 73.96 ng/g in sediments. (Auth.)

J-50068

Betti, M., Colombini, M.P., Fuoco, R., Papoff, P., **Trace elements and polychlorobiphenyls in Terra Nova Bay** [Elementi in tracce e policlorobifenili nella Baia di Terra Nova, Mare di Ross (Antartide)], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p. 117-126, In Italian with English and Spanish summaries. 22 refs.

This paper describes the most significant findings of the analysis of sea water samples from Terra Nova Bay collected by Italian expeditions during the austral summers of 1987-88 (trace element determination) and 1988-89 (polychlorobiphenyl [PCB] determination). The following are the concentration ranges of total dissolved content found in trace elements: cadmium 21-55 ng/l, copper 123-279 ng/l, lead 35-76 ng/l and zinc 95-475 ng/l. The relative standard deviation (rsd) is about 30% for all elements except for zinc (rsd about 50%). The total PCB concentration ranged between 0.5 and 2 ng/l (rsd = 20%) with a distribution among congener classes centered on 3-5 chloro-substituted isomers. The individual concentrations found in some selected congeners (IUPAC numbers: 28, 52, 101 and 180) are also reported. Analysis of particulate matter showed that only about 10% of the total PCB content was associated with the suspensions. (Auth.)

J-50070

Fabiano, M., Povero, P., Medica, D., Danovaro, R., **Particulate organic matter in antarctic waters, 1989-1990** [Distribuzione e composizione della sostanza organica particellata nelle acque antartiche (campagna oceanografica 1989-90)], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p. 133-143, In Italian with English and Spanish summaries. 10 refs.

Particulate organic matter samples were collected during the R/V *Cariboo* cruise (Ross Sea) and in Terra Nova Bay. The first results of the analyses of total suspended matter (TSM), carbohydrates, proteins, lipids, ATP, DNA and RNA in the suspended matter are reported. The data show a significant correlation between TSM and particulate organic matter (POM), a higher POM concentration in Terra Nova Bay than in the Ross Sea, and the prevalence of proteins over carbohydrates in the Bay. Pack melting influences the biochemical composition of the POM. The correlations between POM vs DNA, and RNA vs proteins, are significant. (Auth.)

J-50071

Fabiano, M., **Observations on particulate organic matter in antarctic waters** [Osservazioni sulla sostanza organica particellata nelle acque antartiche], International Seminar on Oceanography in Antarctica. Proceedings, Concepción, ENEA—Centro EULA—Chile, 1992, p. 145-148, In Italian with English and Spanish summaries. 12 refs.

The origin of the particulate organic matter (POM) in antarctic waters is tightly connected with the pack evolution. POM is a relevant reserve of energy for the organisms of the higher trophic levels. The author analyzed the information about chemical POM composition and particularly the content of carbohydrates, proteins and lipids. (Auth.)

J-50112

Bohrmann, G., et al, **Pure siliceous ooze, a diagenetic environment for early chert formation**, *Geology*, Mar. 1994, 22(3), p.207-210, 25 refs.

The formation of marine opal-CT nodules or layers as early diagenetic deposits has been documented only in antarctic deep-sea sediments. In contrast, porcellanites and cherts in land sections and Deep Sea Drilling Project and Ocean Drilling Program drill sites are usually found in sediment sections of Miocene age and older. During R.V. *Polarstern* cruises ANT-IX/3 and 4, young porcellanites were recovered for the first time in contact with their host sediment in two cores from the Atlantic sector of the southern ocean. Chemical and mineralogical studies of these deposits and their surrounding sediments have increased knowledge about very early chert formation. In both cores the porcellanites are embedded in sediments rich in opal-A with extremely low levels of detrital minerals, an environment that seems conducive to a rapid transformation of biogenic silica into porcellanites. (Auth.)

J-50121

Kennett, J.P., ed, Warnke, D.A., ed, **Antarctic paleoenvironment: a perspective on global change. Part two., American Geophysical Union. Antarctic research series**, Antarctic paleoenvironment: a perspective on global change. Part two., 273p., Refs. passim. For individual papers see B-50130, E-50125 through E-50128, E-50131 through E-50134, J-50122 through J-50124, and J-50129.

This the second of two volumes in the American Geophysical Union's Antarctic Research Series to present contributions that deal with the paleoenvironmental and biotic evolution of the antarctic region. The papers are based on work presented at a conference held at the University of California, Santa Barbara, Aug. 28-31, 1991, entitled "The Role of the Southern Ocean and Antarctica in Global Change: An Ocean Drilling Perspective." This volume presents 13 papers of general and synthetic nature on a wide variety of topics. The contributions incorporate a range of recent concepts that deal with the paleoclimatology, paleoceanography and paleobiogeography of the antarctic region, especially in relation to the evolution of the continental cryosphere. The volume is organized so that the papers are presented in general order of geologic age, beginning with the Eocene and ending with the last several hundred years.

J-50122

Wright, J.D., Miller, K.G., **Southern ocean influences on Late Eocene to Miocene deepwater circulation**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.1-25, Refs. p.22-25.

The Eocene through the Miocene marked the transition from warm polar climates of the early Eocene to the development of near-modern climates and deepwater patterns by the late Miocene. The authors have reconstructed deepwater circulation patterns for the late Eocene through the Miocene using $\delta^{13}\text{C}$, $\delta^{18}\text{O}$, and sediment distribution. The $\delta^{13}\text{C}$ reconstructions and unconformities/hiatuses indicate that the southern ocean was the dominant deepwater source for the late Eocene through the Miocene with intervals of increased deepwater production at 40, 36, 30, and 15 Ma. Seismic stratigraphic and carbon isotopic evidence exists for a pulse of Northern Component Water (NCW) production during the earliest Oligocene, indicating that there was bipolar production of deep and bottom waters. Two additional intervals of enhanced NCW production followed in the Miocene, 20 to 16 Ma and 12 to 10 Ma. (Auth. mod.)

J-50123

Mead, G.A., Hodell, D.A., Ciesielski, P.F., **Late Eocene to Oligocene vertical oxygen isotopic gradients in the South Atlantic: implications for warm saline deep water**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.27-48, Refs. p.46-48.

Oxygen isotopic data from Ocean Drilling Program (ODP) sites 699 and 703 confirm the isotopic inversion found in the southern ocean by Kennett and Stott (1990) and interpreted by them as indicating the presence of Warm Saline Deep Water (WSDW) during the Eocene and Oligocene. The authors suggest that the deep water was Warm Saline Deep Water produced by mixing and/or cooling of warm saline water at higher northern latitudes or by mixing of warm saline water produced in restricted basins with colder water during downward advection. A uniform 1 per mill increase in $\delta^{18}\text{O}$ occurred during the earliest Oligocene in ODP sites 689, 690, and 699, ranging from 1400 m to 3400 m paleodepth. Assuming a 0.3-0.4 per mill ice volume effect as suggested by other studies, the data indicate cooling in both the cooler intermediate water and the warmer deep water by 2-2.5 C. Since the shallower and deeper water masses had very different origins, the data indicate that a concomitant cooling occurred in the two source areas. Depending on the exact location of the source areas, this interpretation suggests either an increase in the planetary thermal gradient by 2-2.5 C at this time or a worldwide cooling of the same magnitude. Between 35.8 and 35.2 Ma, a carbon isotopic enrichment of 0.5-1.0 per mill occurred at all depths. This increase, along with evidence for increased occurrence of unconformities, suggests increased rates of overturn of the oceans during the earliest Oligocene, beginning at the $\delta^{18}\text{O}$ increase. (Auth. mod.)

J-50124

Barrera, E., Huber, B.T., **Eocene to Oligocene oceanography and temperatures in the antarctic Indian Ocean**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.49-65, Refs. p.64-65.

Oxygen and carbon isotopic analyses of benthic and planktonic foraminiferal species from the lower Eocene to Oligocene section at Ocean Drilling Program sites 738 and 744 in the Indian Ocean provide insights into the response of polar surface and deep waters during a major climatic cooling and development of continental glaciation on Antarctica. Based on isotopic ranking and $\delta^{13}\text{C}$ values of planktonic foraminiferal species, there is no evidence for major changes in upwelling or productivity as a consequence of cooling at the high latitudes from Early Eocene to Early Oligocene time. The planktonic foraminiferal data indicate that the thermal structure of the water column changed little, not only from Early to Late Middle Eocene but also from Late Eocene to Early Oligocene time. A 1.0 per mill decrease in $\delta^{18}\text{O}$ values of both planktonic and benthic foraminifera occurred at about 42 Ma. Results of high-resolution analyses across the Eocene-Oligocene transition indicate the following: a 1.4 per mill positive shift in foraminiferal $\delta^{18}\text{O}$ values occurred in sediments at the base of Chron 13N deposited at 35.85 Ma; the highest Oligocene *Cibicides* $\delta^{18}\text{O}$ values (2.5 per mill) occurred from 35.85 to 35.24 Ma; increased continental ice accumulation in the Early Oligocene increased the average oceanic $\delta^{18}\text{O}$ composition by at least 0.6 per mill. (Auth.)

J-50129

Lazarus, D., Caulet, J.P., **Cenozoic southern ocean reconstructions from sedimentologic, radiolarian, and other microfossil data**, *American Geophysical Union. Antarctic research series*, 1993, Vol.60, Antarctic paleoenvironment: a perspective on global change. Part two. Edited by J.P. Kennett and D.A. Warnke, p.145-174, Refs. p.172-174.

The Antarctic Convergence marks the northern boundary of the antarctic ocean, a physically distinct region of the world ocean which today contains unique, endemic radiolarian biotas and a distinctive biosiliceous sediment facies on the underlying seafloor. Paleodistributions of these parameters are used to infer southern ocean geographic extent and general circulation for Paleocene, Eocene, Early Oligocene, Late Oligocene to Early Miocene, Late Miocene, and Pliocene time intervals. Local upwelling along plateaus occurs in the Paleocene to Middle Eocene, but no distinct southern ocean can be detected. The Late Eocene shows increased biosiliceous sedimentation, increasing endemism in biotas, and inferred regional oceanic fronts. A geographically extensive southern ocean, Circumpolar Current and Polar Front developed in the Early Oligocene. Limited data suggest decreased water mass contrasts and more cosmopolitan faunas in the Late Oligocene and Early Miocene. Southern ocean environments were again more distinct in the Middle Miocene through Pliocene intervals, with strongly endemic radiolarian faunas and widespread deposition of biosiliceous sediments. (Auth. mod.)

J-50148

Smith, L.T., Chassignet, E.P., Olson, D.B., **Wind-forced variations in the Brazil-Malvinas confluence region as simulated in a coarse resolution numerical model of the South Atlantic**, *Journal of geophysical research*, Mar. 15, 1994, 99(C3), p.5095-5117, 54 refs.

The observed seasonal and interannual fluctuations in the Brazil-Malvinas confluence region are investigated using a wind-driven isopycnic coordinate model of the South Atlantic Ocean south of 10S. The model is configured on a rotated Mercator grid with 2 deg horizontal resolution and five constant-density layers in the vertical. In order to model the passage of the Antarctic Circumpolar Current (ACC) across the basin, the grid is augmented by a channel extension to the west of Drake Passage and east of 50E, having the width of Drake Passage. A series of benchmark experiments with annual mean climatological forcing shows that (1) when bottom topography is included, one observes a reduction in Drake Passage transport in agreement with previous studies, as well as a northward shift in the Brazil Current separation latitude; (2) an increase in Drake Passage transport to realistic values does not cause any further northward shift in

the separation point, and (3) the model is relatively insensitive to the choice of lateral boundary conditions. It is concluded that the locally wind-forced semiannual signal south of the confluence is significantly damped before reaching the Brazil Current region by several factors: friction, the opposing flow of the current itself, and the inability of the Malvinas to penetrate the subtropical circulation that is confined to the upper model layers. (Auth. mod.)

J-50170

García, M.A., et al, **Dynamical oceanography of the Bransfield Strait (Antarctica) during austral summer 1992/93: an application of ERS-1 products**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.553-556, ESA SP-361, 6 refs.

A field experiment, the BIOANTAR 93 oceanographic cruise, was conducted in the Bransfield Strait during summer 1992-93. CTD profiles obtained during the survey allowed identification of water masses and calculation of geostrophic currents. Several self-recording instruments were operated in the study area for nearly three months to obtain time series of wave, tide and current data. The experiment aimed at the study of ocean dynamics in the Bransfield Strait at different time and spatial scales. This report focuses on preliminary work executed on available SAR imagery and WSC data as a first step in the study of the local wave propagation and wind-induced circulation patterns. It does not expand on methodological aspects but displays a number of examples which may better illustrate the present status of activities as regards the Pilot Project goals. (Auth. mod.)

J-50171

Hughes, C.W., Vassie, J.M., Smithson, M.J., **Signal from the southern ocean, detectable by altimetry**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.1, Paris, European Space Agency, 1994, p.587-590, ESA SP-361.

Surface pressure fields from the U.K. Fine Resolution Antarctic Model (FRAM) are used to assess the value of ERS-1 altimetry for monitoring processes of oceanographic interest in the southern ocean. Sampling frequency is shown to be inadequate to monitor eddy scale processes, so attention is turned to larger scale processes, particularly changes in the total transport of the circumpolar current. This is shown to be more difficult than it first appears, the surface signature of a change in transport being a complicated function of space, having small scales and acting in a counterintuitive way. In a third attempt to satisfy both requirements of limited sampling and simplicity of interpretation, a regular signal is sought and found in the form of propagating waves to the east of the Patagonian shelf. It is shown that the sampling of sea surface height by ERS-1 should be adequate to reconstruct these waves, if they exist in the real ocean. (Auth.)

J-50190

Belkin, I.M., **Horizontal structure of the southern ocean frontal zones** [Gorizonta'naiia struktura frontov IUzhnogo okeana], *Antarktika*, 1993, No.31, p.109-127, In Russian with English summary. Refs. p.126-127.

Data on surface temperature (T_0) and salinity (S_0) along 6 crossings of the southern ocean on board the R/V *Akademik Fedorov*, Dec. 1988-Apr. 1989, are presented. The main circumpolar fronts are distinguished as the Polar Front, the Subantarctic Front, and the Subtropical Front. T_0 - S_0 plots showing drastic differences between TS-correlation patterns in different sectors of the southern ocean have been drawn for all 6 crossings. In the southeast Atlantic and in the southeast Indian Ocean at $T_0 > 7^\circ\text{C}$, the relation between T_0 and S_0 is nearly linear. The horizontal structure of frontal zones at scales from hundreds of km down to 1 km has been studied. A cross-frontal stepping of all the fronts has been repeatedly observed, with numbers of steps varying from 2 to 5. Extensive measurements of S_0 with 0.5 km spacing enables one to reliably determine the relation between haline and thermal fronts of the upper layer: in most cases the S-fronts are much narrower than the T-fronts and are enclosed in them. (Auth. mod.)

J-50191

Zozulia, S.A., Maslennikov, V.V., Polonskii, V.E., **Spatial structure of the South Polar Frontal Zone north of South Georgia**

[Prostranstvennaia struktura IUzhnoi poliarnoi frontal'noi zony severnee o-va IUzhnaia Georgiia], *Antarktika*, 1993, No.31, p.128-140, In Russian with English summary. 10 refs.

The characteristics of the South Polar Frontal Zone (SPFZ) structure are presented on the basis of 6 oceanological surveys completed by VNIRO in the polygon north of South Georgia in 1987-1989. Northern and southern SPFZ boundaries have been distinguished after careful analysis followed by classification of water vertical structure at each station. The important role of bottom relief in the formation of quasistationary circulation forms has been determined. The northern boundary is the basic physical front of the SPFZ. A strong meandering is the main feature of the SPFZ spatial structure. The region is notable for the nearness of the high latitude waters (the Weddell Sea waters) and, correspondingly, the so-called Secondary Frontal Zone (SFZ) to the southern boundary of the SPFZ. (Auth.)

J-50192

Soliankin, E. V., **Regional features of biological productivity of antarctic waters** [Regional'nye osobennosti formirovaniia bioproduktivnosti antarkticheskikh vod], *Antarktika*, 1993, No.31, p.141-158, In Russian with English summary. Refs. p.157-158.

Data from regional multidisciplinary studies carried out from 1960 through the 1980s on geostrophic circulation, distribution of water masses and their modifications, the Polar Frontal Zone (PFZ) and the Secondary Frontal Zone (SFZ) are presented. It is pointed out that in the Antarctic, the mesoscale eddying of the current field is one of the abiotic factors responsible for phytoplankton production and that relatively stable eddying is linked to the frontal zones; areas of rich primary productivity and krill abundance are associated with the spreading of the SFZ. Within the PFZ, relatively high numbers of copepods found in early records indicate a high level of phytoplankton production. It is concluded that it is not accidental that dense feeding concentrations of such abundant species as *Electrona Carlsbergi* occur in different areas of the PFZ. An attempt is made to estimate large scale features of distribution of different bioproductivity parameters in various sectors of the Antarctic in relation to structural heterogeneity of hydrophysical field characteristics. (Auth. mod.)

J-50218

Propulsion plant of the James Clark Ross, Maritime defence, Dec. 1991, 16(12), p.376.

This note reports the delivery of the research vessel *James Clark Ross* to the British Antarctic Survey and discusses design criteria which guided construction of its diesel-electric propulsion system.

J-50260

Barrera, E., Huber, B. T., **Paleogene and Early Neogene oceanography of the southern Indian Ocean: Leg 119 foraminifer stable isotope results**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.693-717, Refs. p.715-717.

DLC QE39.T49b

Oxygen and carbon isotopic records of monogeneric and monospecific benthic and planktonic foraminifer samples from Sites 744 and 738 drilled on the southern end of the Kerguelen Plateau during ODP Leg 119 reveal the evolution of polar Indian Ocean water masses from the Early Paleocene to the Middle Miocene. Results from Site 738 are from sediments of Early Paleocene to Late Eocene age and those from Site 744 are Late Eocene to Middle Miocene. They suggest that intermediate waters here did not originate in the high latitudes during the Early Eocene. Surface and near-surface waters cooled gradually after the maximum warming at 56 Ma when surface waters were about 18 C. Intermediate waters cooled after 52 Ma. The highest temperatures of the Cenozoic occurred from 56 to 52 Ma. The records of equatorial Pacific Site 577 and Weddell Sea Site 690 resemble those of the polar Indian Ocean in this interval. The well-documented $\delta^{13}\text{C}$ excursions toward positive values in the Late Paleocene and negative values in the Early Eocene are represented by foraminifers increases of 1.5 per mill and following decreases of about 3 per mill. (Auth. mod.)

J-50306

Olbers, D., **Links of the southern ocean to the global climate**,

NATO Advanced Study Institute on Modelling of Oceanic Climate Interactions, Les Houches, France, Feb. 17-28, 1992. Proceedings. Edited by J. Willebrand et al and NATO Advanced Science Institute, Series I. Global Environmental Change. Vol.11, Berlin, Springer-Verlag, 1993, p.205-241, 47 refs.

DLC GC190.2.M63

This paper examines the processes involved in the heat transport across the Polar Front, the dynamical balance of the Antarctic Circumpolar Current, and formation of bottom water in the Weddell Sea. (Auth. mod.)

J-50307

Lemke, P., **Modelling sea ice-mixed layer interaction**, NATO Advanced Study Institute on Modelling of Oceanic Climate Interactions, Les Houches, France, Feb. 17-28, 1992. Proceedings. Edited by J. Willebrand et al and NATO Advanced Science Institute, Series I. Global Environmental Change. Vol.11, Berlin, Springer-Verlag, 1993, p.243-269, 24 refs.

DLC GC190.2.M63

In this paper, a detailed description of the sea ice and mixed layer model dynamics is presented. A review is given on recent Weddell Sea ice-mixed layer simulations. From a series of model simulations it is shown that the pattern and the magnitude of the oceanic surface buoyancy flux is rather sensitive to the rheological properties used in the sea ice model. A set of experiments investigating the collapse of polynyas after they are formed by anomalous oceanic heating suggests that advective effects coupled with the sea ice thermodynamics and mixed layer dynamics create a strong negative feedback system, damping the response to these short-time perturbations and restoring the model back towards the original seasonal cycle. This system eliminates a polynya much faster than a thermodynamics-only model. Finally, a set of experiments with modified atmospheric and oceanic boundary conditions is discussed. (Auth. mod.)

J-50332

Krishfield, R., Doherty, K., Honjo, S., **Ice-Ocean Environmental Buoys (IOEB); technology and deployment in 1991-1992**, Woods Hole Oceanographic Institution. Technical report, Oct. 1993, WHOI-93-45, 129p., 16 refs.

This report describes the design and performance of a pair of drift buoys deployed at separate sites within the ice floe environment of the Arctic Ocean in 1992 by the Woods Hole Oceanographic Institution. Equipped with an elaborate mooring system to support an array of subglacial sensors, the buoys were designed to acquire and telemeter a complex set of meteorological and oceanographic data relevant to sea ice dynamics in the arctic basin, in an effort to refine understanding of sea ice climatological effects and their relation to global change. Also deployed for comparative purposes by the Scott Polar Research Institute in the Weddell Sea was a simplified version of the same buoy system.

J-50334

Olbers, D., Guretskii, V. V., Seiss, G., Schröter, J., **Hydrographic atlas of the southern ocean**, Bremerhaven, Alfred Wegener Institute for Polar and Marine Research, 1992, 82 plates, 17 refs.

Data collected by ship observations south of 30S in the years 1900-1991 are presented in maps and graphs. The data include potential temperature, salinity, potential density, and dissolved oxygen at 0, 100, 200, 350, 500, 750, 1000, 1500, 2000, 2500, 3000, 3500, and 4000 m; potential temperature, salinity, dissolved oxygen, and depth at the density surfaces of 26.25 (Antarctic Intermediate Water), 27.50 (temperature minimum layer south of the Polar Front), 27.70 (Upper Circumpolar Deep Water), and 27.79 (salinity maximum of the Circumpolar Deep Water); and temperature, salinity, dissolved oxygen, and depth at the core layers of temperature minimum (Winter Water), temperature maximum (Circumpolar Deep Water), salinity minimum (Antarctic Intermediate Water), salinity maximum (Circumpolar Deep Water), and oxygen minimum (Core of the Upper CDW).

J-50339

Domack, E. W., Schere, E., McClennen, C., Anderson, J., **Intrusion of circumpolar deep water along the Bellingshausen Sea**

continental shelf, *Antarctic journal of the United States*, 1992, 27(5), p.71.

During the austral summer of 1987-1988, 15 oceanographic stations were occupied on the Bellingshausen Sea continental shelf from the R/V *Polar Duke*. Up to that time there was little information regarding the oceanographic setting of the area. One of the main objectives of the survey was to determine the extent of circumpolar deep water (CDW) across the continental shelf. Data were collected using a Seabird SBE-19 Seacat Profiler modified with a Sea Tech ST-O10A transmissometer. The temperature maximums ranged from 1.1 to 1.6 C, indicating that CDW is found across the entire portion of the continental shelf.

J-50340

Nelson, D.M., Gordon, L.I., **Distribution and production of biogenic silica in the upper water column of the Ross Sea 1990-1992, *Antarctic journal of the United States*, 1992, 27(5), p.72-74, 11 refs.**

During Feb. and early Mar. of 1992, the authors made the second cruise of an ongoing study on cycling of biogenic silica in the Ross Sea. This work is part of a coordinated interdisciplinary effort to understand the biogeochemical cycling of organic and siliceous matter in the Antarctic. The authors summarize data on silica production rates in 1990 and make a comparison between nutrient and biogenic silica distributions observed in 1990 and 1992. During the summers of 1990 and 1992 the spatial distributions of phytoplankton biomass and nutrients in the upper water column of the Ross Sea were strongly influenced by an intense diatom-dominated phytoplankton bloom in the vicinity of the receding ice edge. To the east of the ice-edge bloom, nutrient and biogenic silica distributions differed significantly in the 2 years. It is not known whether the difference between the 1990 and 1992 data sets results primarily from a seasonal or an interannual difference.

J-50342

Nittrouer, C.A., Pierson, G.H., Morrison, J.M., DeMaster, D.J., **Movement of suspended materials in the Ross Sea, *Antarctic journal of the United States*, 1992, 27(5), p.77-79, 1 ref.**

The spatial distribution of suspended material was investigated as part of a hydrographic survey (salinity, temperature, light transmission, fluorescence) undertaken in the Ross Sea from the R/V *Polar Duke* during Feb. of 1990 and 1992. Over 100 stations were occupied during these cruises. A strong tidal signal is observed at all 3 moorings. The currents are diurnal with a distinct fortnightly modulation. The strongest currents are found at mooring C, and exceed 50 cm per second in both the upper and lower meters. Shear in the water column causes significantly different directions for the upper and lower current records at all three stations. The spatial distribution of water-column turbidity reveals a consistent picture from the two cruises during the austral summer. Light transmission is low at the surface and fluorescence profiles indicate phytoplankton to be the cause. Light transmission increases for most of the deeper water column, with another decrease near the bottom (lower 50 m). The fluorescence records and observations of suspended material collected on filters indicate that this bottom nepheloid layer is due to lithogenic debris.

J-50343

Dunbar, R.B., Leventer, A., **Seasonal variation in carbon isotopic composition of antarctic sea ice and open-water plankton communities, *Antarctic journal of the United States*, 1992, 27(5), p.79-81, 12 refs.**

Sediment trap and suspended particulate samples collected in the Ross Sea during 1990-1991 exhibit a large range in organic-matter delta carbon-13. This led the authors to examine the carbon isotopic composition of other time-series sediment-trap, suspended-particulate, and sea-ice samples they have collected during the past 5 years. A large seasonal cycle was observed in plankton delta carbon-13 in fast-ice communities as well as in sediment-trap samples recovered from McMurdo Sound. The seasonal delta carbon-13 range within fast ice is as great as 17 parts per mill, more than the entire latitudinal range observed in surface plankton and the largest yet reported for any specific phytoplankton community. Delta carbon-13 of particulate organic carbon (POC) within the basal layers of the fast ice increases from winter minima of -23 to -26 parts per mill

in Oct. to late spring maxima of -11 to -17 parts per mill in late Nov./early Dec. The greatest isotopic enrichment during this period generally corresponds with the highest standing stock of POC within the sea ice.

J-50352

Gordon, A.L., Huber, B.A., Martinson, D., **Physical oceanography studies on *Akademik Fedorov* and *Nathaniel B. Palmer* 92-1 and 92-2 in support of Ice Station Weddell 1, *Antarctic journal of the United States*, 1992, 27(5), p.99-100.**

The data collected at Ice Station Weddell (ISW) are augmented by conductivity-depth-temperature (CTD) data from *Akademik Fedorov* and *Nathaniel B. Palmer* during their cruises in support of ISW. The survey clearly shows the near-bottom characteristics found entering the ISW region from the southeast. The ISW data indicate that the final bottom water product is due to more than one bottom water type. There are at least two types of antarctic bottom water feeding the western Weddell Sea—a low-salinity variety and a high-salinity variety that is much like the one observed in the Ross Sea, though not as salty.

J-50353

Gordon, A.L., Huber, B.A., **Ice Station Weddell 1: Thermocline stratification, *Antarctic journal of the United States*, 1992, 27(5), p.100-102, 4 refs.**

The conductivity-temperature-depth (CTD)/Tracer component of Ice Station Weddell 1 (ISW) and associated ship activity was designed to resolve water mass stratification of the Weddell Gyre's western rim. The water column at the ice station is characterized by a relatively thin (mostly 50 to 125 m thick) surface mixed layer, which was not quite as homogeneous (perhaps because the full winter conditions were not yet attained) as observed below the seasonal ice to the east. The pycnocline is somewhat more stable than that found to the east in the seasonal sea ice zone, which suppresses vertical exchange and accounts for the reduced oceanic heat flux. There appears to be a fresh-water input to the pycnocline in the southwestern corner of the gyre that tends to cap the heat of the Weddell deep water (WDW). The WDW temperature maximum ranged from 0.6 C on the southern end of the drift track to 0.4 C at the northern end. Perhaps the most unexpected observation is the thin (200 to 300 m thick) very cold, highly oxygenated bottom boundary layer draped over the sea floor seaward of the shelf break.

J-50354

Martinson, D.G., Padman, L., McPhee, M.G., Morison, J.H., **Upper-ocean variability during Ice Station Weddell, *Antarctic journal of the United States*, 1992, 27(5), p.102-103, 4 refs.**

The upper ocean physics component of Ice Station Weddell (ISW), a field experiment in the western Weddell Sea between Feb. and June 1992, was designed to obtain a time series of upper-ocean properties, horizontal and vertical fluxes, velocities, and shear. Here the authors present some of their initial upper ocean observations.

J-50355

McPhee, M.G., Martinson, D.G., Morison, J.H., **Upper-ocean measurements of turbulent flux in the western Weddell Sea, *Antarctic journal of the United States*, 1992, 27(5), p.103-105, 4 refs.**

For Ice Station Weddell I (ISW), the authors executed a field research program aimed at characterizing the velocity, density, temperature, and turbulent structure of the upper ocean under the multiyear ice pack of the western Weddell Sea. The primary goal was to explore the transfer of momentum and heat between the ice and ocean in this little explored region, which has a potentially important impact on bottom-water transformation and on the climate of the deep world ocean. Two approaches were used; here the authors present a sampling of results from a preliminary analysis: one set from the manned station turbulence-cluster mast during a storm in late Mar., and the second, a month-long record of estimated ocean and ice heat flux from the buoy cluster initially 50 km west of the manned station.

J-50356

Padman, L., Levine, M.D., **Thermal finestructure and turbulence in the western Weddell Sea, *Antarctic journal of the***

United States, 1992, 27(5), p.105-107, 7 refs.

As part of the joint Russian/U.S. ice camp, Ice Station Weddell 1 (ISW), the authors deployed a temperature recorder mooring and micro-structure profiler to measure the small-scale oceanic variability in the upper 350 m under the pack ice of the western Weddell Sea. A brief review of these measurements is presented, emphasizing the small-scale mixing and diffusive processes that appear to be most responsible for vertical fluxes of heat, salt, and momentum in the upper pycnocline and mixed layer.

J-50357

Muench, R.D., Morehead, M.D., Gunn, J.T., **Regional current measurements in the western Weddell Sea**, *Antarctic journal of the United States*, 1992, 27(5), p.108.

As part of the joint U.S./Russian Ice Station Weddell (ISW) experiment that took place in the western Weddell Sea during Feb.- June 1992, the authors have obtained measurement of upper layer (down to 200 m) ocean currents using drifting current meter arrays deployed through the ice pack. The pack ice motion at each array was tracked using an Argos drift buoy; the ocean currents are to be derived by correcting the measured relative ice water currents for ice drift. Upper layer temperature and salinity measurements were obtained using a conductivity/temperature/depth profiler (CTD) and will be used in analysis of the current data.

J-50362

Schlosser, P., Weppernig, R., Smethie, W.M., Jr., Mathieu, G., **Ice Station Weddell (ISW) tracer-oceanography program**, *Antarctic journal of the United States*, 1992, 27(5), p.117-118, 9 refs.

As part of the Ice Station Weddell (ISW) hydrographic program, water samples were collected for shore based analysis of several tracers, including the steady-state tracers oxygen-18, helium-3, and helium-4, and the transient tracers tritium, CFC 11, and CFC 12. Oxygen-18 and helium-4 data will be used to study the contribution of waters modified by interaction with glacial ice to deep and bottom water in the Weddell Sea.

J-50363

Nolting, R.F., De Baar, H.J.W., **Behaviour of nickel, copper, zinc and cadmium in the upper 300 m of a transect in the southern ocean (57-62S, 49W)**, *Marine chemistry*, Feb. 1994, 45(3), p.225-242, 41 refs.

This transect covers the Scotia Sea, the Confluence and the Weddell Sea. These three water masses are clearly separated by their temperature and salinity regimes. Also, the nutrients show different concentration gradients, with that of silicate most pronounced, with concentrations decreasing from 60-80 microM in the Weddell Sea to 20-30 microM in the Scotia Sea. Below 100 m, Cd concentrations are high in the Scotia Sea and lower in the Weddell Sea, but there is still a strong covariance with phosphate. The Cd/phosphate ratio is, however, different in each of the three areas. In contrast with Cd, the Cu concentrations are lower in the Scotia Sea and higher in the Weddell Sea, and show some relation with silicate. Zn shows the same distribution pattern as Cd, and the relation with silicate is specific for each of the three regions on its own. The distribution of Ni is more complex, but the highest concentrations appear to be in the upper surface layer of the Scotia Sea. Lower concentrations are found in the Weddell Sea. Some covariation with the nutrients is found for Ni. It is shown that the surface waters in the turbulent area around the Antarctic Peninsula are not only characterized by their salinity, temperature and nutrient properties, but also by different trace metal contents. In each of the three areas, the differences in the actual concentrations are more dependent on the time of sampling than on the exact sampling position. (Auth. mod.)

J-50372

Martinson, D.G., Rind, D., Parkinson, C.L., **Exploring the southern ocean response to climate change. Final report, U.S. National Aeronautics and Space Administration. Contract report**, 1993, NASA-CR-194601, 3p., N94-15680, 5 refs.

The purpose of this project was to couple a regional (southern ocean) ocean/sea ice model to the existing Goddard Institute for Space Science (GISS) atmospheric general circulation model (GCM). This modification recognizes the relative isolation of the southern ocean; the need to account prognostically for the significant air/sea/ice interaction through all involved components; and the advantage of translating the atmospheric

lower boundary (typically the rapidly changing ocean surface) to a level that is consistent with the physical response times governing the system evolution (that is, to the base of the fast-responding ocean surface layer). The deeper ocean beneath this layer varies on time scales several orders of magnitude slower than the atmosphere and surface ocean, and therefore the boundary between the upper and deep ocean represents a more reasonable fixed boundary condition.

J-50404

Wang, L.P., **Dynamic role of ridges in a beta-plane channel. Towards understanding the dynamics of large scale circulation in the southern ocean**, *Woods Hole Oceanographic Institution. Doctoral dissertation*, Sep. 1993, MIT/WHOI-93-38, 251p., Ph.D. thesis. Refs. p.246-251.

The dynamic role of bottom topography in a B-plane channel is systematically studied in both linear homogeneous and stratified layer models in the presence of either wind stress or buoyancy forcing. In these studies, the structure of the geostrophic contour plays a fundamental role, and the role of bottom topography is looked at from two different angles. It is shown that blocking all the geostrophic contours leads to two different physical processes in which bottom topographic form drag is generated and enables geostrophic flow in a B-plane channel to support a net cross-channel volume transport. It is demonstrated that by blocking all the geostrophic contours in the presence of a sufficiently high ridge, the dynamics of both source-sink and wind driven circulation in a B-plane is similar to that in a closed basin.

J-50408

Williams, E.T., **Introduction and dispersal of suspended sediment from the Cayley Glacier into Brialmont Cove, Antarctica**, Clinton, NY, Hamilton College, 1994, 49p., B.A. thesis. 10 refs.

This report examines the mechanisms of terrigenous sediment input from the Cayley Glacier and the cove circulation patterns responsible for suspended sediment dispersal in Brialmont Cove. Data are derived from an extensive series of CTD hydrocast stations that were performed as part of a United States Antarctic Program aboard the R/V *Polar Duke* in Dec. 1990. The results show different terrigenous sedimentation processes to be dominant at various depths, and that tidal flushing may have an integral role at bottom depths. As a result of the open bay physiography in Brialmont Cove, the meltwater plumes entering into the head of the cove from the Cayley Glacier are strongly influenced by the Coriolis effect. This effect directs the meltwater plume into the western region of the cove and subsequently drives a clockwise circulation system. The western side of the cove is consequently dominated by cool, relatively fresh meltwater, while the eastern portion of the cove is dominated by warmer, higher salinity outer bay water. (Auth. mod.)

J-50410

Ferreira, G.A., Schloss, I.R., **Oceanic front project on board the icebreaker *Alte. Irizar* in 1988-1989** [Campaña Irizar 1988/89, datos preliminares. Proyecto Frentes Oceánicos Antárticos (FOCA)], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1993, No.413, 38p., In Spanish with English summary. 13 refs.

During the antarctic summer cruise of 1988/89 on board the icebreaker A.R.A. *Alte. Irizar* three transects were performed. Several physical parameters were measured and samples for biomass and determination of phytoplankton composition were taken by means of a continuous sampler. The aim of the present work was to correlate both physical and biological data, and relate them with the frontal zones between the different waters navigated. Preliminary results are discussed. (Auth.)

J-50413

Bathmann, U., ed, **Expeditions ANTARKTIS X/6-8 of the Research Vessel *Polarstern* in 1992-93** [Die Expeditionen ANTARKTIS X/6-8 des Forschungsschiffes *Polarstern* 1992/93], *Berichte zur Polarforschung*, 1994, No.135, 236p., Mostly English, some German.

The tenth antarctic expedition of RV *Polarstern* began on Nov. 14, 1991 and ended on Feb. 24, 1993. This report deals with the last three legs, ANT X/6, 7 and 8. The cruise leg ANT X/6 started Sep. 29, 1992 in Punta Arenas commencing the Joint Global Ocean Flux Study (JGOFS) in the southern ocean. The main goals of this cruise were the assessment of biological, chemical and physical processes on plankton development and carbon dynamics in ice-free areas and in the marginal ice zone. The systems of the sea-ice, the upper mixed water column and the sea-sediment interface received special attention. Various experiments were conducted on board *Polarstern* to investigate specific biological processes of phyto-, zooplankton and bacteria and the microbial network. On Dec. 3, 1992 *Polarstern* left Cape Town for its ANT X/7 leg. Physical oceanography dominated the scientific activities which included investigations of the vertical structure of the water column in terms of temperature and currents. Moorings with current meters and sediment traps were also exchanged in the northern Weddell Sea. The main aim of the cruise, however, was the repetition of a hydrological transect between Kapp Norvegia and Joinville within a long-term program of the World Ocean Circulation Experiment (WOCE). Accordingly, 18 moorings were recovered and 8 new ones deployed together with a closely spaced CTD-transect. Investigations on plankton and benthos, nutrients, bacterial activities and the effect of UV-B radiation on marine organisms completed the scientific program.

J-50427

Argentina. Dirección Nacional del Antártico, **Structure and dynamics of coastal ecosystems at Jubany Station. Data report** [Estructura y dinamica de un ecosistema costero antártico. Estación científica "Teniente Jubany," en la isla 25 de Mayo (King George Island) islas Shetland del Sur. Reporte de datos. Contribución No.419], Buenos Aires, Instituto Antártico Argentino, 1944, 65p., In Spanish. Refs. passim. For individual papers see B-50432 through B-50435, E-50430, E-50431, J-50427 and J-50428.

This is a collection of reports of results obtained during the first stage of joint investigations of Potter Cove carried out at Jubany Station by the Instituto Antártico Argentino (Coastal Ecology Project) and the Alfred Wegener Institut, Germany. The investigations cover topographic surveys, oceanographic physical and biological features, benthic flora and fauna, and feeding habits of a group of crustaceans.

J-50428

Klöser, H., **Basic description of Potter Cove and adjacent open coasts** [Descripción básica de caleta Potter y costas abiertas adyacentes], Buenos Aires. Instituto Antártico Argentino. Contribución, 1994, No.419, Structure and dynamics of coastal ecosystems at Jubany Station. Data report, p.5-16, In Spanish. 5 refs.

Some results of bathymetric, hydrographic, oceanographic and biological investigations, carried out jointly by German and Argentine scientists at Potter Cove in 1993-1994, are summarized.

J-50429

Schloss, I., et al, **Phytoplankton and particulate matter variations in relation to environmental parameters at Potter Cove** [Variación de la biomasa fitoplanctónica y del material particulado en suspensión en relación a algunos parametros ambientales en caleta Potter], Buenos Aires. Instituto Antártico Argentino. Contribución, 1994, No.419, Structure and dynamics of coastal ecosystems at Jubany Station. Data report, p.17-30, In Spanish. 6 refs.

Annual variations of temperature, salinity and chlorophyll *a*, and qualitative and quantitative variations of suspended particulate matter in the water column, were studied in samples collected throughout the year at 2 stations in Potter Cove at 0, 5, 10, 20 and 30 m depth. Preliminary results are discussed and presented in charts and graphs. The highest percentage of organic matter was recorded on Dec. 3, 1991, coinciding with a high chlorophyll concentration.

J-50443

Ning, X.R., et al, **Standing crop and productivity of phytoplankton and POC in Prydz Bay and the adjacent waters,**

Antarctic research (Chinese edition), Dec. 1993, 5(4), p.50-62, In Chinese with English summary. 15 refs.

Standing stock and productivity of phytoplankton and their cell size structure and the relations with environmental factors in Prydz Bay and the adjacent waters of the Indian sector of the southern ocean were observed during the summer of 1990-1991. The results showed that there was obvious spatial zonation of the above parameters in the studied area. In the Bay and the adjacent shelf, chlorophyll, cell abundance, POC and primary productivity were high, which resulted from higher stability of water masses. Offshore beyond the continental shelf between West Ice Shelf and Shackleton Ice Shelf, biomass and productivity of phytoplankton and POC were also high. Opposite distribution trends of these parameters were displayed in both east and west zones of the studied area. The results of size-fractionation showed that the contributions of nanoplankton with picoplankton to total phytoplankton biomass was 53%, and to total productivity, 69%, which proved their importance in the phytoplankton community of antarctic waters. (Auth. mod.)

J-50446

Wang, Y.H., Dong, H.L., Ren, D.Y., **Chemical characteristics of seawater in the Prydz Bay, Antarctica, *Antarctic research (Chinese edition)***, Dec. 1993, 5(4), p.83-89, In Chinese with English summary. 6 refs.

Based on data collected in the summer of 1989-1990, the relationship between the distribution of nutrients and productivity in Prydz Bay is discussed. Outside of the Amery Ice Shelf area, a large expanse of warm water with a high nutrient content, where the dissolved oxygen is up to 120% and the chlorophyll *a* concentration is more than 1.00 mg/cu m, establishes Prydz Bay as a high productivity area. The vertical distribution of chemical elements merges with a spring-like temperature layer, resulting in an abnormal vertical distribution of nutrients at 350 m depth. There is no discernible salinity spring layer. Various factors causing the abnormal distribution are discussed. (Auth. mod.)

J-50453

Wilkin, J.L., Morrow, R.A., **Eddy kinetic energy and momentum flux in the southern ocean: comparison of a global eddy-resolving model with altimeter, drifter, and current-meter data, *Journal of geophysical research***, Apr. 15, 1994, 99(C4), p.7903-7916, 24 refs.

The ability of a seasonally forced high-resolution global ocean general circulation model to simulate eddy variability and associated energy and momentum transfer processes in the southern ocean is assessed by comparing model statistics with observations. The observations include Geosat altimeter data analyzed for surface velocity variance at satellite ground track crossover points, current-meter data from the Agulhas and Campbell plateaus, and surface drifter data in the Tasman Sea. In western boundary currents and energetic regions of the Antarctic Circumpolar Current, model eddy kinetic energy is lower than observed by typically a factor of 4, and in less energetic regions by a factor of 10. Differences in the location and extent of energetic regions are related to smoothness of the model bathymetry and other features of the model configuration. Eddy momentum flux divergence and eddy-to-mean kinetic energy conversion at the surface are diagnosed from the model. These show regions where eddy activity accelerates the mean flow through instability processes. Observational estimates of these terms are computed using mean flow gradients from hydrography, climatology and altimeter eddy statistics. Several features of the spatial distribution of the observational estimates are consistent with the model and suggest that future calculations of mean currents from altimeter data will allow direct computation of eddy-to-mean current momentum and energy conversion terms. (Auth.)

J-50454

Berthelot, B., Deschamps, P.Y., **Evaluation of bio-optical algorithms to remotely sense marine primary production from space, *Journal of geophysical research***, Apr. 15, 1994, 99(C4), p.7979-7989, 57 refs.

In situ bio-optical measurements from several oceanographic campaigns, including stations located within the Antarctic Divergence, have been analyzed to derive a direct relationship between water column primary production P_t ocean color as expressed by the ratio of reflectances R_1 at 440 nm and R_3 at 550 nm and photosynthetically available radiation

(PAR). The study is restricted to the Morel case I waters for which the following algorithm is proposed: $\log(Pt) = -4.286 - 1.390 \log(R_1/R_3) + 0.621 \log(PAR)$, with Pt in $g\ C/m^2/d$ and PAR in $J/m^2/d$. Using this algorithm the rms accuracy of primary production estimate is 0.17 on a logarithmic scale, i.e., a factor of 1.5. Using spectral reflectance measurements in the entire visible spectral range, the central wavelength, spectral bandwidth, and radiometric noise level requirements are investigated for the channels to be used by an ocean color space mission dedicated to estimating global marine primary production and the associated carbon fluxes. Nearly all the useful information is provided by two channels centered at 440 nm and 550 nm, but the accuracy of primary production estimate appears weakly sensitive to spectral bandwidth, which consequently may be enlarged by several tens of nanometers. The sensitivity to radiometric noise, on the contrary, is strong, and a noise equivalent reflectance of 0.005 degraded the accuracy on the primary production estimate by a factor 2 (0.14-0.25 on a logarithmic scale). The results should be applicable to evaluating the primary production of oligotrophic and mesotrophic waters, which constitute most of the open ocean. (Auth. mod.)

J-50526

Takahashi, T., et al, **Seasonal variation of CO₂ and nutrients in the high-latitude surface oceans: a comparative study**, *Global biogeochemical cycles*, Dec. 1993, 7(4), p.843-878, 59 refs.

Seasonal data for pCO₂ and concentrations of CO₂ and nutrients in high-latitude surface oceans obtained by the Lamont-Doherty CO₂ group and Marine Research Institute, Reykjavik, are presented and analyzed. The seasonal progression and relationships between these properties are described, and their inter-ocean variation is compared. Seasonal changes in CO₂ and nutrients were more gradual in the North Pacific and the nutrients were only partially consumed in the surface waters of the subarctic North Pacific Ocean and southern ocean. The magnitude of seasonal changes in nutrient concentrations in the North Pacific and southern oceans was similar to that observed in the North Atlantic and adjoining seas. In the subpolar and polar waters of the North and South Atlantic and North Pacific Oceans, pCO₂ and the concentrations of CO₂ and nutrients were much higher during winter than summer. During winter, the high latitude areas of the North Atlantic, North Pacific, and Weddell Sea were sources for atmospheric CO₂; during summer, they became CO₂ sinks. This is attributed to the upwelling of deep waters rich in CO₂ and nutrients during winter, and the intense photosynthesis occurring in strongly stratified upper layers during summer. (Auth. mod.)

J-50530

Dafner, E.V., Mordasova, N.V., **Influence of biotic factors on the hydrochemical structure of surface water in the Polar Frontal Zone of the Atlantic Antarctic**, *Marine chemistry*, Jan. 1994, 45(1/2), p.137-148, 42 refs.

An investigation conducted in a Polar Frontal Zone site in the spring-summer season of 1988-1989 was followed by four smaller surveys. The study of abiotic conditions included measurements of O₂, NO₃, PO₄, SiO₂ etc. Smaller-scale surveys conducted after the basic survey showed that, due to intensive phytoplankton growth, autotrophic organisms were actively consuming nutrients yielding high concentrations of chlorophyll *a* (4.5 micrograms/l). Silicate dropped from 10-55 microM to less than 2.5 microM, and phosphate from 1.8-2.0 to 0.85 microM. Phytoplankton blooms resulted in a spatial redistribution of abiotic gradient zones and the formation of 'biological' fronts. The silicate horizontal gradient at such fronts thus amounted to 7.22 microM per k. (Auth.)

J-50534

Paterson, W.S.B., **World sea level and the present mass balance of the antarctic ice sheet**, NATO Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.131-140, 16 refs.

To determine whether the ice sheets are growing or shrinking by calculating each term in their mass budget is not possible at present; the uncertainties, particularly in the iceberg-calving flux, are too great. Using the observed rise in world sea level may be a better method. Two recent studies of tide-gauge data, world-wide, corrected for post-glacial rebound and excluding data from regions where tectonic plates converge, give a

rate of rise of 1.8 +/- 0.5 mm/a. The records cover approximately the past 100 years and so provide information about mass balances over the same period. The contributions of thermal expansion of the oceans, changes in the amount of water stored as groundwater and in lakes and reservoirs, the recession of glaciers other than the Greenland and antarctic ice sheets, and changes in mass of the Greenland Ice Sheet are estimated, based on a literature review. There remains a residual of 0.65 +/- 0.61 mm/a. This suggests that the grounded part of the Antarctic Ice Sheet has lost mass at an average rate of 235 Gt/a during the past century. (Auth. mod.)

J-50536

Maier-Reimer, E., **Driving force of brine rejection on the deep-water formation in the Hamburg LSG OGCM**, NATO

Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.211-216, 5 refs.

During formation of sea ice with its low salinity, salty cold brine is rejected which also starts convection. As the ice grows, however, the effective heat transition across the ice decreases, hence the formation of new ice will reduce. It is not a priori clear which of these processes predominates. Several one-dimensional studies have been performed to study the dynamical balance between these mechanisms. However, the brine rejection acts only in winter; in summer, the salinity of the surface water is reduced by the release of meltwater. The effectiveness of the brine pump is thus limited by the slowness of the ice movement. The locations of freezing and melting should be different to allow for a maximum action. In the Northern Atlantic both regions are separated, indicating that convection is primarily driven by surface cooling. Around Antarctica the region of strong convection partly overlaps the ice coverage. Here, the brine rejection may substantially contribute to the convection. For a quantitative estimate of the individual contributions to the deep thermohaline circulation this note describes an experiment with the Hamburg LSG OGCM (Large Scale Geostrophic Ocean General Circulation Model), in which the salinity of sea ice has been increased from zero to 33 pSU. This value is slightly less than the minimum salinity of open ocean waters. (Auth. mod.)

J-50537

Jenkins, A., **Melting of continental ice in the ocean and its impact on surface and bottom waters**, NATO Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.217-235, 37 refs.

When continental ice comes into contact with ocean water the ice melts. This causes vertical motion in the water column, because the accompanying input of buoyancy occurs at locations which lie predominantly below the sea surface. Both melting and convective mixing must be considered in evaluating the impact of ice on the surrounding ocean. Some of the most important effects are demonstrated with a simple numerical model of the interaction between pure ice and stratified saline water. Specific examples are drawn from the southern ocean, which receives the majority of the ice discharged from today's continental ice sheets, but the same principles could be applied to any region where continental ice comes into direct contact with the ocean. It is found that the melting of thick icebergs may have a relatively small impact on surface water properties and hence on the static stability of the water column. The upwelling of deeper waters induced by the melting process may even cause a minor warming and enrichment of heavy isotopes near the base of a surface mixed layer. Melting and mixing at the underside of floating ice shelves can produce a water mass of sufficient density to participate directly in the formation of bottom waters. (Auth. mod.)

J-50539

Fichefet, T., Hovine, S., **Glacial ocean: a study with a zonally averaged, three-basin ocean circulation model**, NATO

Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environ-

mental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.433-458, 45 refs.

A zonally averaged primitive equation model is developed to investigate the oceanic general circulation of the last glacial maximum. The Atlantic, Indian, and Pacific basins are separately resolved, and are connected in the Southern Hemisphere by a circumpolar channel through which mass, heat, and salt are exchanged. The model circulation is driven, in addition to wind forcing, by restoring the sea-surface temperature and salinity to prescribed values. Under present-day boundary conditions, the model reproduces the global conveyor belt: deep water is formed in the Atlantic between 60 and 70N and in the vicinity of Antarctica, while the Indian and Pacific basins show broad upwelling. The simulated temperature and salinity fields and the computed meridional heat transport are in general agreement with the observational estimates. When glacial conditions for temperature and salinity are used to force the model, significant changes occur in the circulation patterns. Most of the deep Atlantic is filled with water originating from the model southern ocean. Deep-water production completely stops between 60 and 70N in the Atlantic. However, the surface-water salinity around 50N is sufficiently high to permit deep convection to a maximum depth of 2000 m, as a source of intermediate and deep waters. (Auth. mod.)

J-50542

Martinson, D.G., **Ocean heat and seasonal sea ice thickness in the southern ocean**, NATO Advanced Research Workshop on Ice in the Climate System, Aussois, France, Sep. 6-12, 1992. Proceedings. Edited by W.R. Peltier and NATO Advanced Science Institutes, Series I. Global Environmental Change. Vol.12, Berlin, Springer-Verlag, 1993, p.597-609, 21 refs.

Typical values of the winter air-sea ice heat flux in the seasonal sea ice region of the Weddell Sea imply that the observed thermodynamic sea ice thickness in the region is much thinner than that expected in the absence of ice divergence or ocean sensible heat flux. Therefore, the ice must be dynamically thinned by ice divergence and/or by the presence of an ocean sensible heat flux which reduces the latent heat loss component of the air-sea heat flux and thus reduces the amount of ice growth. For an average air-sea flux of 35 W/m² over 5 months of the winter ice-covered cooling period, the amount of ice thinned must be about 1.6 m. Measurements of ice divergence near the central gyre region suggest that it is sufficient to account for 0.9 m of ice thinning. Consideration of representative characteristics of the temperature and salinity profiles from this region suggest that the ability of the water column to resist free convection, relative to the amount of heat released by any such convection, indicates that at the least (i.e., ignoring upwelling and diffusive fluxes) 20% of the air-sea heat flux must be satisfied in the form of ocean sensible heat. If the upwelling and diffusive contributions to the heat flux are included, the best minimum estimate of the ocean sensible heat flux is 19 W/m². This amount of ocean sensible heat will prevent 1.1 m of ice from growing. (Auth. mod.)

J-50551

Catalano, G., Benedetti, F., Boldrin, A., **Hydrologic conditions in Terra Nova Bay in summer of 1987-1988** [Le condizioni idrologiche a Baia Terra Nova: ossigeno disciolto, nutrienti ed alcuni elementi maggiori nell'estate australe 1987/88], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.593-604, In Italian with English summary. 13 refs.

The Italian oceanographic campaign of 1987-88 was carried out in Terra Nova Bay, where a grid of 40 hydrological stations was performed as well as a transect stretching for 120 mi from the coast eastward into the Ross Sea. The hydrology of the Bay was found to be affected mainly by the Ross Shelf Sea Water (RSSW), where a characteristic summer water is layered in the inner part of the Bay. Melting-ice water is present in the outer part of the Bay and in the eastern part of the transect. In contrast with the homogeneity of the RSSW, which is also reflected in the parameters depending on phytoplankton activity as oxygen, AOU and nutrients, the thermohaline zonation of surface water induces different situations for the

same parameters in the surface layer. A comparison among these zones is performed on the base of AOU values and depletion of nutrients. (Auth. mod.)

J-50561

Baldrin, A., Rabitti, S., **Oceanographic biology of eastern Weddell Sea** [Oceanografia biologica del Mare di Weddell orientale (EPOS Leg 3)], Atti del IX Congresso Nazionale della Associazione Italiana di Oceanologia e Limnologia (A.I.O.L.), S. Margherita Ligure 20-23 Novembre, 1990. (Proceedings of the 9th Congress of the Italian Association of Oceanology and Limnology (A.I.O.L.), S. Margherita Ligure, Italy, Nov. 20-23, 1990.) Edited by G. Albertelli, W. Ambrosetti, M. Piccazzo and T. Ruffoni Riva, Genova, Consiglio Nazionale delle Ricerche, 1992, p.697-707, In Italian with English summary. 12 refs.

Results of observations on basic hydrological parameters, oxygen content and amount, and characteristics of suspended matter (particles concentration, total dry weight, particle size distribution, particulated organic carbon, nitrogen and chlorophyll *a* contents), performed in the Halley Bay area during Jan.-Mar. 1989, are presented. Surface waters near the ice shelf show low concentrations of particulated matter, indicating a low productive condition of the area. In deeper, cold and well oxygenated water the suspended matter concentrations were lower. In the continental shelf area, with an average depth of about 300 m, maximum concentrations were observed of particulated matter. In open water, concentration levels generally appeared lower, yet higher than in the ice shelf area. Near the bottom, the suspended matter load is increasing, as evidenced particularly by the concentration in number of particles. Particle size distribution in the ice shelf area presented peaks around 7-10 microns (typical of diatom populations), whereas in open waters the dominant modes resulted at 3-4 microns, to be associated with flagellates and small diatom communities. (Auth.)

J-50581

Danabasoglu, G., McWilliams, J.C., Gent, P.R., **Role of mesoscale tracer transports in global ocean circulation**, *Science*, May 20, 1994, 264(5162), p.1123-1126, 20 refs.

Ocean models routinely used in simulations of the Earth's climate do not resolve mesoscale eddies because of the immense computational cost. A new parameterization of the effects of these eddies has been implemented in a widely used model. A comparison of its solution with that of the conventional parameterization shows significant improvements in the global temperature distribution, the poleward and surface heat fluxes, and the locations of deepwater formation. Brief references are made to the Antarctic Circumpolar Circulation, and to the Ross and Weddell Seas; some of the figures include data from between 45S and 75S. (Auth. mod.)

J-50590

Poisson, A., et al, **Variability of sources and sinks of CO₂ in the western Indian and southern oceans during the year 1991**, *Journal of geophysical research*, Dec. 15, 1993, 98(C12), p.22,759-22,778, 70 refs.

For the period from Jan. to Sep. 1991, spatial and temporal variations of sea surface carbon dioxide fugacity (fCO₂) in the antarctic, subantarctic, subtropical, and tropical regions of the Indian Ocean (including the Red Sea) are described. The measurements were made continuously with an infrared technique during seven cruises. Temporal variations are studied of fCO₂ at daily, monthly and seasonal scales in selected areas. Both spatial and temporal fCO₂ variations are large near the subtropical and subantarctic fronts. Then described are the seasonal air-sea fCO₂ differences (ΔfCO_2) for the whole western Indian Ocean and corresponding antarctic sector (18,000 observations). In the circumpolar front zones there is a large potential CO₂ sink in summer. In the antarctic waters, fCO₂ spatial variability is very high at mesoscale, especially in the area of the Kerguelen Plateau. Finally, it is shown that in some oceanic areas, well-defined relations exist between fCO₂ distribution and temperature and salinity. If we want to use them to constrain mappings of continuous fCO₂ fields from sparse observations, such relations must be considered at regional and at least seasonal scales. (Auth. mod.)

J-50626

Tsuchiya, M., Talley, L.D., McCartney, M.S., **Water-mass distri-**

butions in the western South Atlantic; a section from South Georgia Island (54S) northward across the equator, *Journal of marine research*, Jan. 1994, 52(1), p.55-81, Refs. p.79-81.

A long CTD/hydrographic section with closely spaced stations was made in Feb.-Apr. 1989 in the western Atlantic Ocean between 0 deg 40'N and South Georgia along a nominal longitude of 25W. Vertical sections of various properties from CTD and discrete water-sample measurements are presented and discussed in terms of the large-scale circulation of the South Atlantic Ocean. One of the most important results is the identification of various deep-reaching fronts in relation to the large-scale circulation and the distribution of mode waters. Another significant result is a detailed description of the complex structure of the deep and bottom waters. The Weddell Sea Deep Water is the densest water observed and forms a relatively homogeneous layer at the bottom of the Georgia and Argentine Basins. The bottom layer of the Brazil Basin is occupied by the vertically and laterally homogeneous Lower Circumpolar Water. (Auth. mod.)

J-50630

Cai, W.J., **Circulation driven by observed surface thermohaline fields in a coarse resolution ocean general circulation model**, *Journal of geophysical research*, May 15, 1994, 99(C5), p.10,163-10,181, 52 refs.

This paper reports the results from a series of mechanistic studies on the global ocean circulation by assimilating a set of observed surface thermohaline data into a low-resolution Geophysical Fluid Dynamics Laboratory (GFDL) global ocean general circulation model (OGCM). In most of the experiments the surface wind stress is set to zero. Even in the absence of explicit wind forcing, the major circulation features are reproduced. In particular, water mass properties are realistic, and the Antarctic Circumpolar Current (ACC) and the Gulf Stream have significant barotropic components (especially the ACC). The feature of realistic water masses can be attributed to the reproduction of convection-dominated heat and freshwater fluxes in the polar and subpolar regions, where these water masses are formed. In the low-resolution model, the barotropic ACC is broad; this seals the Indian Ocean from the Atlantic Ocean, and prevents both the barotropic and baroclinic interbasin exchange between the Indian and the Atlantic oceans. In this scenario, the North Atlantic Deep Water (NADW) outflow is compensated by the cool and fresh South Pacific water from east of Drake Passage (cool water route). When convection is used as a device to suppress ACC, and to ensure that the NADW is the only deep water source, the NADW formation is seen to cause a large Indonesian throughflow. The teleconnection between the throughflow and the NADW is via the Agulhas leakage water. In the absence of ACC, the NADW outflow is compensated by the warm and salty Indian water through the leakage (warm water route). The results show that the realization of the warm water route depends on the structure of the modeled ACC. (Auth. mod.)

J-50631

Schlosser, P., et al, **Distribution of ^{14}C and ^{39}Ar in the Weddell Sea**, *Journal of geophysical research*, May 15, 1994, 99(C5), p.10,275-10,287, 30 refs.

Carbon 14 and ^{39}Ar data from the Weddell Sea are presented and discussed. Values of $\delta^{14}\text{C}$ and ^{39}Ar are low in the winter mixed layer ($\delta^{14}\text{C}$ approximately -90 to -125 per mill; ^{39}Ar approximately 85% modern). These low values are consistent with the surface layer dynamics which is dominated by entrainment of relatively old water of circumpolar origin and reduced gas exchange during sea ice cover. The $\delta^{14}\text{C}$ and ^{39}Ar values of the deep and bottom waters range from -160 to -150 per mill and 38 to 57% modern, respectively. The $\delta^{14}\text{C}$ values of Weddell Sea Bottom Water (WSBW) found in the central Weddell Sea along a 0 deg longitude section are only slightly higher than those of the overlying Weddell Sea Deep Water (WSDW) showing that the influence of bomb ^{14}C on these waters is small. Part of the WSBW with higher $\delta^{14}\text{C}$ values observed in the northwestern Weddell Sea seems to escape through the South Sandwich Trench, and part seems to mix from a boundary current into the central Weddell Sea. The observed ^{14}C distribution is consistent with the hypothesis that Ice Shelf Water (ISW) is a source of WSBW. A simple conceptual model of the surface layer dynamics is used to estimate the prebomb $\delta^{14}\text{C}$ values of Surface Water and Winter Water to be about -140 and -130 per mill, respectively. (Auth. mod.)

J-50643

Shimmield, G., **^{234}Th and ^{210}Po disequilibrium as a tracer of**

particle production and sinking associated with plankton blooms in the marginal ice zone: evidence from the Bellinghausen Sea, Antarctica, Environmental radioactivity in the Arctic and Antarctic; proceedings of the International Conference on Environmental Radioactivity in the Arctic and Antarctic, Kirkenes, Norway, Aug. 23-27, 1993. Edited by P. Strand and E. Holm, Østerås, Norway, Scientific Committee of the Environmental Radioactivity in the Arctic and Antarctic, Dec. 1993, p.225-227.

This work is the first detailed examination of dissolved and particulate natural short-lived radio isotopes in the Bellinghausen Sea. The impact of phytoplankton blooms plays a strong role in influencing the depth distribution of these particle-reactive nuclides. By using simple box-models, the removal rate of organic matter from the euphotic zone may be estimated. The hydrography of the marginal sea ice zone may affect radionuclide distributions quite strongly. (Auth.)

J-50649

Yang, H.F., McTaggart, A.R., Davidson, A.T., Burton, H., **Measurement of acrylic acid and dimethyl sulfide in antarctic coastal water during a summer bloom of *Phaeocystis pouchetii***, NIPR Symposium on Polar Biology, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.43-52, 12 refs.

Water samples were collected during a summer bloom of *Phaeocystis pouchetii* from the beginning of Nov. 1988, in a 15 m water column 10 km offshore of Davis Station. Results of acrylic acid and DMS determined by HPLC and GC show that concentrations of acrylic acid varied from 0.001 to 0.51 micromol/l and DMS from 0.003 to 0.588 micromol/l. Both showed an increase after late Dec. 1988 and maximum concentrations in early Jan. 1989, followed by a rapid decrease to low levels by mid Jan. to Feb. The observed changes of both substances showed good agreement with variations in cell numbers of *P. pouchetii*; the correlative coefficients of acrylic acid and DMS against cell numbers of *P. pouchetii* are all 0.998. The highest observed productivities of acrylic acid and DMS were 9.76×10^{-8} micromol/cell and 13.09×10^{-8} micromol/l, respectively. (Auth.)

J-50697

Ohshima, K.I., Kawamura, T., **Oceanographic data in Lützow-Holm Bay of the Antarctic Climate Research program from January 1991 to February 1992 (JARE-32)**, *Japanese Antarctic Research Expedition. JARE data reports*, Mar. 1994, No.198, 35p.

From 1989 to 1992, under the Japanese Antarctic Climate Research program, extensive observations of ocean and sea ice were carried out in and near the Lützow-Holm Bay by JARE-31 and -32. The data, including CTD, XBT, AXBT, dissolved oxygen and vertical current profiles, obtained between Jan. 1991 and Feb. 1992, are discussed and presented in graphs and tables.

J-50717

Lynch-Stieglitz, J., Fairbanks, R.G., **Conservative tracer for glacial ocean from carbon isotope and palaeonutrient measurements in benthic foraminifera**, *Nature*, May 26, 1994, 369(6478), p.308-310, 25 refs.

The ratio of cadmium to calcium (Cd/Ca) and the carbon isotope ratio ($\delta^{13}\text{C}$) in the calcite tests of benthic foraminifera both record nutrient distributions in the ocean. It is shown that these two proxies can provide complementary information about the movement of deep water in the glacial ocean. Cd concentration is used to infer the age history of glacial deep water, and deduce the sources of deep water from the carbon isotope air-sea exchange signature, a conservative tracer that is constructed using both Cd and $\delta^{13}\text{C}$ measurements. Analysis suggests that there are at least two sources of glacial deep water: a less dense component originating in the North Atlantic Ocean, and a more dense component which may have originated in the Pacific Ocean. These findings also provide further support for a Pacific glacial deep water source, evidence for which has until now been both scarce and conflicting. Comparisons are made with the ^{13}C isotope ratios found in antarctic waters. (Auth. mod.)

J-50734

Klöser, H., et al, **Hydrography of Potter Cove, a small fjord-like inlet on King George Island (South Shetlands), *Estuarine, coastal and shelf science*, 1994, 38(5), p.523-537, Refs. p.536-537.**

The hydrography of Potter Cove is described in detail for one summer season. Recorded data include wind, air temperature, water temperature, salinity and water color. From these, information on surface circulation patterns and dynamics of suspended sediments are derived. Possible sources of sediment input are discussed. As a result, a complex interaction between wind forcing, circulation and seasonal melt of high glacier surfaces emerges. (Auth.)

J-50763

Penrose, J.D., Conde, M., Pauly, T.J., **Acoustic detection of ice crystals in antarctic waters, *Journal of geophysical research*, June 15, 1994, 99(C6), p.12,573-12,580, 17 refs.**

During the voyage of the RSV *Aurora Australis* to the region of Prydz Bay in Jan.-Mar. 1991, ice crystals were encountered at depths from the surface to 125 m in the western area of the bay. On two occasions, crystals were retrieved by netting, and echo sounder records were used to infer additional regions of occurrence. Acoustic target strength estimates made on the ice crystal assemblies encountered show significant spatial variation, which may relate to crystal size and/or aggregation. Data from a suite of conductivity-temperature-depth casts have been used to map regions of the study area where *in situ* water temperatures fell below the computed freezing point. Such regions correlate well with those selected on the basis of echogram type, and imply that ice crystals occurred at depth over large areas of the bay during the cruise period. The ice crystal distribution described is consistent with that expected from a plume of supercooled water emerging from under the Amery Ice Shelf and forming part of the general circulation of the bay. If misinterpreted as biota on echo sounder records, ice crystals could significantly bias biomass estimates based on echo integration in this and possibly other areas. (Auth. mod.)

J-50765

Killwirth, P.D., Nanneh, M.W., **Isopycnal momentum budget in the Antarctic Circumpolar Current in the Fine Resolution Antarctic Model, *Journal of physical oceanography*, June 1994, 24(6), p.1201-1223, 30 refs.**

The momentum budget of the Antarctic Circumpolar Current (ACC) is analyzed with data from the Fine Resolution Antarctic Model (FRAM), using density as a vertical coordinate, since density is approximately conserved on streamlines. This steady budget is balanced. Volume, heat, and salt budgets are also computed within density layers, although these remain time-dependent. By restricting attention to the net form drag on a layer, wind stress is found to be balanced by Coriolis force, and if the layer outcrops, the amount of wind stress put into the layer where it outcrops. Between 40 and 60% of the density layers at any latitude outcrop somewhere at the surface, so that wind stress can be moved directly into these layers, totally unlike the quasigeostrophic situation. In layers dense enough to ground at the ocean floor, the form drag changes sign several times, following the sign changes in the northward volume flux through the Coriolis term. These north-south fluxes are produced by time-dependent filling or emptying of fluid layers south of the ACC. This shows that although FRAM and other marginally eddy-resolving models reach apparent statistical steady dynamical states in about a decade, this is illusory; the long-time thermodynamic behavior affects the dynamics. The authors show that balances from a time-averaged dataset are not accurate guides to the time-averaged balances. (Auth. mod.)

J-50833

Smith, W.O., Jr., et al, **Phytoplankton biomass in the western Ross Sea: comparison between 1990 and 1992, *Antarctic journal of the United States*, 1992, 27(5), p.131-132, 3 refs.**

As a part of a coordinated interdisciplinary study on the production of biogenic material in the surface layer, its flux and remineralization through the water column, and its accumulation in sediments, the distribution, primary productivity and new production of the phytoplankton assemblage were measured in the western Ross Sea. To test if the gradients in sediment accumulation were a function of the surface productivity, the authors sampled the upper 150 m in two separate years (1990 and 1992). The den-

sity distribution in 1990 was not noticeably different from that in 1992, which suggests that loss processes or temporal differences in production may have been responsible for the differences between standing stocks for the two years. Sediment trap data from 1992 are presently being analyzed to test the differences in loss processes from the surface layer to subeuphotic depths.

J-50836

DiTullio, G.R., Smith, W.O., Jr., **Spatial variability in dimethyl sulfide concentrations in the Ross Sea, February 1992, *Antarctic journal of the United States*, 1992, 27(5), p.135-137, 8 refs.**

Dimethyl sulfide (DMS) is a volatile biogenic gas that is involved in regulating the Earth's radiative balance and hence its climate. During a multidisciplinary study in the Ross Sea (Feb. 1992), the authors measured oceanic DMS concentrations along 3 transects. They report here the DMS and chlorophyll *a* concentrations from 4 representative stations. The DMS concentration at each station was unique in that each had a significantly different integral average concentration from the other stations. The stations on the southernmost transect (along 76S) revealed the highest DMS concentrations. The authors are currently analyzing the phytoplankton species composition (by both high-performance liquid chromatography pigment analysis and microscopy) to determine whether floristic changes in phytoplankton species composition are responsible for the observed spatial variability in oceanic DMS concentrations or if other biological/physical factors are important.

J-50847

Keys, H.J.R., **Antarctic stratigraphic drilling east of Cape Roberts in southwest Ross Sea, Antarctica. Final comprehensive environmental evaluation, Turangi, New Zealand, Department of Conservation, 1994, 115p., 53 refs.**

A proposal is presented for an international drilling project to obtain a series of at least four cores of 500 m, forming a continuous sequence of over 1500 m, from the ocean bottom at depths to 600 m under the 2 m thick fast ice, about 20 km off Cape Roberts in the Ross Sea. Four drilling seasons in Oct. and Nov. are proposed for 1995-1997 with subsequent years as required. The scientific objective is to obtain a record of the antarctic glacial and tectonic history from the Cretaceous and Cenozoic, 36 to more than 100 m.y.a. Possible environmental risks are summarized, but it is suggested that with reasonable precautions they can be minimized.

J-50859

Park, Y.H., Gamberoni, L., Charriaud, E., **Frontal structure, water masses, and circulation in the Crozet Basin, *Journal of geophysical research*, July 15, 1993, 98(C7), p.12,361-12,385, 46 refs.**

Due to topographic steering by the Crozet and Kerguelen Plateaux, the Antarctic Circumpolar Current (ACC) in the Crozet Basin area shifts to its northernmost position in the southern ocean, along the southern limb of the South Indian subtropical gyre. Here the jet-like current is embedded within a narrow band, <200 km, of the frontal zone which marks a sharp transition between subtropical and subantarctic waters, hugging the flanks of the Crozet and Kerguelen Plateaus. The confluence of the ACC and the Agulhas Return Current north of Crozet further intensifies downstream baroclinic shear strength. Eastward transport at the entrance of the Crozet Basin is estimated at 35 Sv (1 Sv=10⁶ cm³/s). About 75% of the ACC transport through the Drake Passage passes through Kerguelen-Amsterdam Passage, the remainder passing south of Kerguelen. The Crozet Basin provides an important source for the formation and modification of water masses. These different varieties of Crozet Basin Mode Water correlate closely with the degree of exchange and mixing between subtropical and subantarctic waters along the dynamically active frontal zone. (Auth. mod.)

J-50860

Quartly, G.D., Srokosz, M.A., **Seasonal variations in the region of the Agulhas Retroflexion: studies with Geosat and FRAM, *Journal of physical oceanography*, Sep. 1993, 23(9), p.2107-2124, 36 refs.**

Seasonal variations in the Agulhas Retroflexion region are studied by analyzing data from the radar altimeter on the Geosat satellite, and output from the Fine Resolution Antarctic Model (FRAM). Observations of

mesoscale variability from Geosat suggest that any seasonal variation is confined to certain limited areas of the Agulhas Retroflexion region. Results from FRAM appear to show no seasonal variability, despite the fact that the model is driven by a seasonally varying wind field. A by-product of this study is a comparison between Geosat observations and FRAM output. This shows that apart from the issue of seasonal variations, there is reasonable agreement, and that such differences as do exist give insights into how the model might be improved. (Auth. mod.)

J-50956

Hinze, H., **Charting the bathymetry of Weddell Sea, Antarctica**, *Marine geodesy*, Apr.-June 1994, 17(2), p.139-145, 7 refs.

The Federal Republic of Germany has carried out several marine research expeditions, including multibeam surveys by the research vessel *Polarstern*, in the South Atlantic Ocean. Since the bathymetry of the Weddell Sea is insufficiently known, the Alfred Wegener Institute for Polar and Marine Research (AWI) is preparing bathymetric maps for this region. One project is the production of the series named "AWI Bathymetric Charts of the Weddell Sea (AWI BCWS)." These are several computer-based bathymetric charts in 1:1,000,000 scale following the index of the GEBCO (General Bathymetric Charts of the Oceans) Ocean Plotting Sheet. The Weddell Sea region is inhomogeneously covered by data of different source, type, and quality. The data have to be checked for errors of position determination and depth measurement. Examples are given for some aspects of data validation. The depth data have to be integrated, compiled and compared with other non-bathymetric information for mapping, e.g., gravity anomalies. (Auth. mod.)

J-50966

Orsi, A.H., **On the extent and frontal structure of the Antarctic Circumpolar Current**, College Station, Texas A and M University, 1993, 75p., University Microfilms order No. 94-10841, Ph.D. thesis. Refs. p.66-72.

Large-scale features of the Antarctic Circumpolar Current (ACC) are described using all historical hydrographic data available from the southern ocean. A dynamic topography map of the upper kilometer reveals the highly-sheared eastward flow of the ACC. Strong steering of the current's path is caused by the bottom ridges around Antarctica. The near surface tracer distributions differentiate the ACC from the warmer and saltier waters of the subtropical regimes. The Subtropical Front, interrupted only by South America, marks the northern limit of the ACC. Distributions of properties on isopycnal surfaces show an abrupt end to the southward shoaling of Upper Circumpolar Deep Water (UCDW), as it is entrained into the mixed layer. This sharp boundary nearly coincides with the southernmost circumpolar streamline passing through Drake Passage. To its south are the weakly-sheared circulations of the subpolar regime. Inspection of many crossings of this transition lead to a definition for the southern boundary of the ACC as the poleward edge of UCDW. About 100 Sv flow eastward between the meridional limits of the ACC. At Drake Passage, three deep-reaching fronts account for most of the ACC transport. The third deep-reaching front observed to the south of the Polar Front at Drake Passage continues with similar characteristics as a circumpolar feature. It is called here the southern ACC front. (Auth.)

J-50976

Liang, X.S., Su, J.L., Dong, Z.Q., **Pseudoinverse determination of the circulation in Prydz Bay and its adjacent open ocean, Antarctica**, *Antarctic research*, Dec. 1993, 4(2), p.42-61, 17 refs.

An inverse model is used to infer the circulation in Prydz Bay and its adjacent open ocean, using hydrographic data obtained on the cruise of the 7th Chinese National Antarctic Research Expedition, 1990-91. Barotropic components are found to be strong in the study area, especially at the Antarctic Divergence, and the velocity is rather low. In the open ocean the flow is quasizonal, but outside the bay it shows a tendency to press onto the shelf from surface to bottom, and to intensify just east of Fram Bank. It is suggested that this is the most likely place to detect the Antarctic Bottom Water formation. The meridional profiles of the distribution indicate a strong (relative to the ambient) core and a slope-trapped part. In the southeastern part of the bay there seems to exist a strong coastal current flowing westward. The computed upwelling centers are mainly situated to the west of the study region, which agrees well with early hydrographic observations and with areas of high krill biomass. (Auth.)

J-50990

Cheng, X.H., Pan, J.M., Zhang, H.S., Zhang, P., **Biolimitation of iodine distribution in antarctic ocean**, *Oceanologia et limnologia sinica*, 1994, 25(1), p.38-47, In Chinese with English summary. 14 refs.

Based on the analysis of samples collected during the 6th Chinese Antarctic Expedition, the geochemical distribution of iodine species and chemical forms are discussed. Special interest is directed to the relations among the iodine species and parameters related to organism activity. The concentrations of total inorganic iodine are from 0.267 to 0.443 micromol/dm³ (mostly iodate) in the surface seawater. There are close relations between nutrients and the concentrations of iodine and iodate. The results show that the dissolved organic iodine concentration, distributed stably horizontally and vertically, is about 10% of the total inorganic iodine. The absorption and assimilation rate of phytoplankton for iodine is about 0.17 micromol/m²/d; the associated iodine as suspended organic particulates is about 4.3 micromol/m³, in which the iodine in standing crop averages 16%. The deposit rate of the particulate iodine is more than 7.2d/m in the euphotic zone. A biogeochemical cycle model is proposed. (Auth.)

J-51022

Sosik, H.M., Vernet, M., Mitchell, B.G., **Comparison of particulate absorption properties between high- and mid-latitude surface waters**, *Antarctic journal of the United States*, 1992, 27(5), p.162-164, 3 refs.

The goal of this study is to examine differences in measured pigment-specific particulate absorption coefficients between surface waters from the Gerlache Strait and from the California current. The study was conducted on three cruises. Samples were collected from stations in the Gerlache Strait on the Research on Antarctic Coastal Ecosystem Rates 3(RACER3) cruise in Dec. 1991 to Jan. 1992 and from two California Cooperative Oceanic Fisheries Investigations (CalCOFI) cruises. Results support the hypothesis of Mitchell and Holm-Hansen (1991) that high-latitude surface waters have low detrital absorption and a low a_{ph}^* when compared to temperate waters. This variability is manifest in models for light propagation through the water column and for ocean color algorithms. Bio-optical modeling of primary production will also be affected by this type of regional variability. To better understand the magnitude and distribution of variability in particle optics is a critical step toward the development of more accurate bio-optical algorithms.

J-51023

Dore, J.E., Karl, D.M., **RACER: Distribution of nitrite in the Gerlache Strait**, *Antarctic journal of the United States*, 1992, 27(5), p.164-166, 9 refs.

The horizontal distribution of dissolved nitrite was examined during the three quasi-synoptic fast sampling grids performed in the Gerlache Strait during the RACER3 cruise to the Antarctic Peninsula region (1991-1992 austral summer). In addition, depth profiles of nitrite (0 to 200 m) were generated at the time-series station A (equivalent to fast grid station 33) during each of the 4 occupations. The depth profiles of nitrite are shown in a figure. All show near-surface maxima with depth-decreasing concentrations. While the total water column (0 to 200 m) content of nitrite decreased slightly from Dec. 25-30, nitrite in the upper 10 m continued to rise. A subsurface nitrite maximum, omnipresent in oligotrophic open oceans, was not observed at station A. The authors believe that the shape and development of the station A nitrite profiles indicate an early to mid-bloom situation (type MB), and that the rapidly accumulating nitrite at shallow depths is most likely a product of phytoplankton nitrite excretion during nitrate assimilation.

J-51030

Dore, J.E., et al, **RACER: Distributions of nitrogenous nutrients near receding pack ice in Marguerite Bay**, *Antarctic journal of the United States*, 1992, 27(5), p.177-179, 8 refs.

During the RACER3 cruise to the Antarctic Peninsula region, a series of hydrocasts were made along a transect in Marguerite Bay, south of Adelaide I. Twelve stations were occupied, beginning at the edge of a large formation of pack ice and extending into the open waters of the bay. The authors report here preliminary results on distributions of dissolved

nitrate, nitrite and ammonium along this transect. Analysis of these results provides an initial evaluation of the nutritional status of the microbial communities near to and away from the receding ice edge.

J-51034

Panouse, M., **Attenuation and backscattering of natural light in the waters of the Gerlache Strait, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.185-186, 2 refs.

Analysis of 20 optical datasets, collected during the 1991-1992 RACER cruise at various locations in the Gerlache Strait, is reported. The results show for each parameter the mean values over the Gerlache Strait, along with the coefficient of variation as an index of variability. For each group of optical and pigment parameters, the best-fit model and the significance, at the 1% level, of the correlation between components of the group are given.

J-51038

Frouin, R., Hermanto, R., **Analytical modeling of the specific intensity of sunlight backscattered by the ocean**, *Antarctic journal of the United States*, 1992, 27(5), p.195-197, 8 refs.

The authors find that the approximate solutions of the radiative transfer equation proposed by Sobolev (1963) can be used to simulate the bidirectional reflectance of the ocean. Because Sobolev's solutions are not suitable for strongly anisotropic phase functions, accurate results can only be obtained by considering that the photons at scattering angles below 40 deg can only be absorbed by phytoplankton. This substantially decreases the anisotropy factor of the phase function, making Sobolev's formalism applicable. Depending on the particle phase function, the scattering angle threshold may vary, but 40 deg should provide reasonable results in most cases. The advantage of Sobolev's solutions is not only their accuracy but also their analytical nature.

J-51041

Frouin, R., Berthelot, B., **Semi-analytical radiative transfer model to simulate the specific intensity of sunlight reflected by the atmosphere and ocean**, *Antarctic journal of the United States*, 1992, 27(5), p.202-205, 10 refs.

In order to retrieve near-surface phytoplankton pigment concentration from ocean color data collected during the 1991-1992 RACER campaign, a fast, yet accurate radiative transfer model of the specific intensity of sunlight reflected by the atmosphere and ocean (including backscattering by the water body) is required. This model must run fast because of the large amount of data to be processed, which prevents the use of Monte Carlo, successive orders of scattering codes, or any computer-intensive code. Although this model must include simplifying assumptions, it will retain the essential physics of the problem. The authors have built such a model. The purpose of this brief report is to present the model, to examine the relative influence of the input parameters, to use the model to simulate actual aircraft data, and to discuss improvements as well as future validation activities.

J-51042

Frouin, R., **Near-surface phytoplankton pigment concentration in the Gerlache Strait derived from aircraft-polarization-and-directionality-earth-reflectance data (POLDER)**, *Antarctic journal of the United States*, 1992, 27(5), p.205-208, 8 refs.

Several aircraft missions were flown over the Gerlache Strait during the 1991-1992 RACER campaign for the purpose of mapping near-surface phytoplankton pigment concentration and primary production, and hence to extend spatially the local observations made aboard R/V *Polar Duke*. The ability of the POLDER instrument to remotely sense ocean color accurately, and thus to provide quantitative estimates of near-surface phytoplankton pigment concentration, was tested. POLDER estimates of pigment concentration along the aircraft subtrack are presented and compared with values measured during fast grid C. The accuracy of the estimates and potential sources of error are discussed.

J-51043

Wang, L.P., **Linear homogeneous model for topographic control of the Antarctic Circumpolar Current**, *Journal of marine research*, July 1994, 52(4), p.649-685, 12 refs.

In a study which examines the dynamics of the Antarctic Circumpolar Current, the results from the homogeneous channel model discussed by Wang and Huang (1994) is extended to a model whose geometry consists of a zonal channel and two partial meridional barriers along each boundary at the same longitude. Both the model transport and the model circulation are significantly affected by the presence of the two meridional barriers. There is a critical height of the ridge between the two partial meridional barriers, above which all geostrophic contours in the channel are blocked. The model demonstrates the importance of the topographic form-drag generation via the Sverdrup flow forced by the wind stress curl. In terms of the circulation structure, the presence of a southern barrier has a far more profound influence than that of a northern one. The northern barrier only has a localized influence on the circulation pattern, while the southern barrier has a global influence in the channel. In addition, the model demonstrates that most of the potential vorticity dissipation occurs around the northern barrier. (Auth. mod.)

J-51048

Stein, M., Heywood, R.B., **Antarctic environment-physical oceanography: the Antarctic Peninsula and southwest Atlantic region of the southern ocean**, *Southern ocean ecology: the BIOMASS perspective*. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.11-24, Refs. p.22-24.

DLC QH95.58.S68

The BIOMASS Programme recognized the need for a concurrent study of the marine environment if the short- and long-term fluctuations in the distribution, abundance, productivity and behavior of the organisms were to be understood. The environments of the seas off the Antarctic Peninsula and of the Scotia Sea are particularly complex. Waters of the Antarctic Circumpolar Current, the Weddell Gyre, and the Eastwind Drift intermingle within an area of complex topography, which includes Drake Passage, Bransfield Strait and the Scotia Arc, to produce complex mixtures of water masses. This paper seeks to collate for the biologist those descriptions of features of these environments which could assist in interpreting biological observations.

J-51049

Smith, N., Tréguer, P., **Physical and chemical oceanography in the vicinity of Prydz Bay, Antarctica**, *Southern ocean ecology: the BIOMASS perspective*. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.25-43, Refs. p.41-43.

DLC QH95.58.S68

This review examines hydrological and chemical data collected during French and Australian cruises in the Prydz Bay region. After a brief introduction to the geographical and topographical characteristics of the region, the present understanding of the general circulation in the vicinity of Prydz Bay is discussed, based primarily on data from the Australian cruises. The principal water masses in the study region are identified; French cruise data are used to estimate open ocean entrainment into the winter water layer, and to assess variability and formation mechanisms of deep water masses.

J-51050

Priddle, J., Brandini, F., Lipski, M., Thorley, M.R., **Pattern and variability of phytoplankton biomass in the Antarctic Peninsula region: an assessment of the BIOMASS cruises**, *Southern ocean ecology: the BIOMASS perspective*. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.49-61, Refs. p.60-61.

DLC QH95.58.S68

In this chapter, the authors consider the results from cruises in the vicinity of the Antarctic Peninsula, with emphasis on the SIBEX station grid in Bransfield Strait and the southern Drake Passage. Measurements of phytoplankton biomass (as particulate chlorophyll *a*) and concentrations of inorganic nutrients were carried out on most cruises as standard measurements at hydrographic stations. Results from most of the cruises have been published and the information has served to enhance and broaden understanding of the phytoplankton biomass distribution and biogeography in the area. The authors have set out to identify the additional value of the BIOMASS phytoplankton data as a single coherent data set, as opposed to the analyses of individual cruises.

J-51051

Jacques, G., Fukuchi, M., **Phytoplankton of the Indian Antarctic Ocean**, Southern ocean ecology: the BIOMASS perspective. Edited by S.Z. El-Sayed, Cambridge, University Press, 1994, p.63-78, Refs. p.76-78.

DLC QH95.58.S68

The antarctic ocean encircles the antarctic continent; the specific area and the main characteristics of each oceanic sector are defined by the shape and position of the continent; the bottom topography; the position of frontal zones; and the extent of the pack-ice. In this review, the authors try to characterize, for each of the four subsystems of the Indian sector, the nutrient regime, the level and nature of primary productivity, and the nature of the factors which control primary production.

J-51076

Holm-Hansen, O., et al, **In situ evidence for a nutrient limitation of phytoplankton growth in pelagic antarctic waters**, *Antarctic science*, Sep. 1994, 6(3), p.315-324, Refs. p.323-324.

Studies in a large (30,000 km²) sampling grid around Elephant I. during Jan.-Mar. of four successive years (1990-1993) have shown that one of the water types within the sampling area (Drake Passage water) shows low chlorophyll *a* in surface waters and a subsurface maximum between 50 and 80 m depth. Ancillary data (beam attenuation, *in situ* chl *a* fluorescence) support the view that the extracted chl *a* values actually do represent increased phytoplankton biomass at depth. Other data (oxygen concentrations and upwelling radiance at 683 nm) suggest that the phytoplankton within this subsurface maximum layer are photosynthetically active and do not represent a senescent sinking population of cells. Such deep chl *a* maxima were found only in Drake Passage waters; in the other four water types sampled, chl *a* concentrations were maximal in surface waters and decreased with depth. Phytoplankton biomass and activity in Drake Passage waters are suggestive of a nutrient limitation for phytoplankton growth in surface waters. The data presented in this paper support the hypothesis that availability of Fe may limit phytoplankton biomass in pelagic antarctic waters, but not in coastal waters where Fe concentrations are relatively high. (Auth. mod.)

J-51101

Nøst, O.A., Foldvik, A., **Model of ice shelf-ocean interaction with application to the Filchner-Ronne and Ross ice shelves**, *Journal of geophysical research*, July 15, 1994, 99(C7), p.14,243-14,254, 23 refs.

A simple analytical model has been developed to study the formation of Ice Shelf Water (ISW). A relation between potential temperature and salinity in the ISW layer is calculated from the mass and energy balance. This temperature-salinity relation is shown to depend only on the temperature and the salinity of the source water mass and to be practically independent of entrainment and melt rates. The model is in good agreement with observations under the Ronne Ice Shelf, and it indicates that ISW in the Filchner Depression is formed from Western Shelf Water (WSW) with salinity higher than 34.75 practical salinity units. Such high-salinity water is only observed in the Ronne Depression in the western part of the continental shelf. This implies a circulation of WSW under the Filchner-Ronne Ice Shelf, from the Ronne Depression into the Filchner Depression. Similarly, the model shows that the ISW observed under J9 at the Ross Ice Shelf has been formed from Low Salinity Shelf Water (LSSW) from the eastern parts of the Ross Sea continental shelf. LSSW must therefore circulate under the eastern parts of the Ross Ice Shelf. (Auth. mod.)

J-51108

Tilbrook, B.D., Karl, D.M., **Dissolved methane distributions, sources, and sinks in the western Bransfield Strait, Antarctica**, *Journal of geophysical research*, Aug. 15, 1994, 99(C8), p.16,383-16,393, 48 refs.

Dissolved methane (CH₄) concentrations were measured in the upper water column (0-200 m) of western Bransfield Strait and southwestern Drake Passage on four cruises between Dec. 1986 and Mar. 1987 during the Research on Antarctic Coastal Ecosystem Rates (RACER) experiment. Methane concentration profiles were similar on all four cruises and showed distinct geographic variability. The highest CH₄ concentrations were associated with the shelf waters surrounding Bransfield Strait and the South Shetland Is. In the deeper waters of central Bransfield Strait, CH₄

tended to decrease to near-saturation values. The distribution of CH₄ appears to be largely controlled by mixing, coupled with the addition of CH₄ to waters flowing over the shallow shelves in the region. On the basis of these results the net air-sea CH₄ fluxes in the southern ocean out to the edge of the seasonal ice zone are small and should not significantly alter current estimates of the oceanic source of CH₄ to the atmosphere. (Auth. mod.)

J-51131

Silva S., N., Helbling, E.W., Holm-Hansen, O., **AMLR program: Inorganic nutrient concentrations relative to water masses around Elephant Island, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.219-221, 11 refs.

The distribution of inorganic nutrients throughout the U.S. AMLR study area is related to their importance as possible limiting factors for growth of phytoplankton, and their utility in tracing or identifying different water masses. During the 1991-1992 field season around Elephant I., nutrient samples were collected at 4 standard depths throughout the water column (0-750 m) at 136 stations: 64 in Survey A and 72 in Survey D. In this paper, the authors present nutrient data from both AMLR field season cruises and discuss their distribution in relation to water masses. The water mass features present in the AMLR study area indicate at least 4 different water types. These water types are the result of the mixing of 2 general water masses [Antarctic Surface Water (AASW) and Upper Circumpolar Deep Water (UCDW)] and 2 more local water masses [Bransfield Surface Water (BSW) and Bransfield Deep Water (BDW)]. AASW, which is mostly to the west and north of Elephant I., and BSW, which is mostly to the south of Elephant I., are generally limited to the upper 150 m of the water column. Nitrate and phosphate concentrations in surface waters were high during both surveys done in 1991. The range of silicate concentrations were similar during surveys A and D (during 1992), but their distribution patterns changed as shown in a figure.

J-51132

Holm-Hansen, O., Villafañe, V.E., Helbling, E.W., **AMLR program: Phytoplankton abundance and rates of primary production around Elephant Island, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.221-223, 5 refs.

This study was part of the U.S. AMLR program, with its major objective being to determine food reservoirs available for grazing zooplankton. In order to achieve this objective, different modes of sampling were used during the time period from Jan. 15-Mar. 18, 1992: collection of samples at discrete depths for measurement of chlorophyll *a* (chl-*a*), particulate organic carbon and nitrogen, phytoplankton species concentration and carbon content, rates of primary production; continuous measurement with depth (0-750 m) of *in vivo* chl-*a* fluorescence, beam attenuation coefficient, attenuation of solar radiation (400-700 nm); and continuous measurement of *in vivo* chl-*a* fluorescence and beam attenuation coefficient of water from 5 m depth. In this paper, the authors report distribution and abundance of phytoplankton biomass as estimated by chl-*a* and rates of primary production.

J-51136

Amos, A.F., Lavender, M.K., **AMLR program: Dynamics of the summer hydrographic regime at Elephant Island, Antarctica**, *Antarctic journal of the United States*, 1992, 27(5), p.228-230, 8 refs.

The 1991-1992 field season of the U.S. AMLR program was the third where physical oceanographic measurements were made aboard the NOAA ship *Surveyor* in conjunction with biological studies of other AMLR groups. As knowledge of the Elephant I. region oceanography has increased, a grid sampling plan and station transect locations have been developed to study the spatial and temporal variability. The authors concentrate here on the standard oceanographic parameters to describe the dynamics of the circulation during the 1991-1992 austral summer. They also briefly examine the temporal changes observed in the month separating the two cruise legs in the position of a front north of Elephant I.

J-51140

Hofmann, E.E., Lascara, C.M., Klinck, J.M., **Palmer LTER: Upper-ocean circulation in the LTER region from historical sources**, *Antarctic journal of the United States*, 1992, 27(5), p.239-241, 15 refs.

Historical descriptions of water mass distributions and circulation patterns are available for selected portions of the LTER region. These previous studies were either concentrated on subareas within the LTER study area or were at the periphery of the LTER region. The purpose of this paper is to synthesize the existing hydrographic and current observations to provide a description of the major circulation features in the LTER study region. This circulation pattern is shown schematically in a figure and is described.

J-51143

Prézelin, B.B., Moline, M., Seydel, K., Scheppe, K., **Palmer LTER: Temporal variability in HPLC pigmentation and inorganic nutrient distribution in surface waters adjacent to Palmer Station, December 1991-February 1992, *Antarctic journal of the United States*, 1992, 27(5), p.245-248, 7 refs.**

A set of nearfield stations were established in waters adjacent to Palmer Station in the austral spring of 1991. Ranges of hydrographic, optical, chemical, and biological properties of the water columns at these sites were repeatedly characterized during late austral spring and summer (Dec. 1991-Mar. 1992). The data will be used to define patterns and scales of variability for food-chain parameters in the area surrounding important nesting and fledging sites for large populations of antarctic seabirds. Here the authors present preliminary data on the temporal variability and possible succession of phytoplankton communities within surface waters of the Palmer grid and their correspondence with changes in the availability of major plant nutrients.

J-51145

Smith, R.C., et al, **Palmer LTER program: Hydrography and optics within the peninsula grid, November 1991 cruise, *Antarctic journal of the United States*, 1992, 27(5), p.250-253, 9 refs.**

Controls on phytoplankton production reflect the space/time variability in ice cover, turbulent mixing, nutrient availability, and solar irradiance. The authors selected an LTER sampling strategy to elucidate the relative importance of these mechanisms. Their hydrographic and bio-optical observations provide data necessary to quantify linkages between the physical and biological components of the system. During the Palmer LTER cruise on the R/V *Polar Duke* in mid-Nov. 1991, they used the bio-optical profiling system (BOPS II) to sample and define the physical, optical, chemical, and biological characteristics of the marginal ice zone in the large-scale area surrounding Palmer Station.

J-51146

Smith, R.C., Baker, K.S., Handley, P., Newberger, T., **Palmer LTER program: Hydrography and optics within the peninsula grid, zodiac sampling grid during the 1991-1992 field season, *Antarctic journal of the United States*, 1992, 27(5), p.253-255, 9 refs.**

The linkages between different trophic levels is a key focus of the Palmer LTER program. The authors established a fixed set of sampling stations (Palmer grid) within the small boat range of Palmer Station, in order to provide high-resolution time-series data in the immediate area of the LTER predator field and sampling linkage with cruise observations on the larger-scale PalLTER peninsula grid. They are analyzing the data with respect to the coupling between physical forcing, optical properties, nutrient distribution, and biological variability, with the goal to define and model this coupling, using full spectra bio-optical models.

J-51176

Smith, D.A., Locarnini, R.A., Lipphardt, B.L., Jr., Hofmann, E.E., **XBT data collected aboard R/V *Nathaniel B. Palmer*, March-May 1993. Research conducted as part of the Palmer Long-Term Ecological Research program, U.S. Antarctic Research Program. *Palmer LTER. Technical report*, Dec. 1993, CCPO-TR-93-06, 158p., 1 ref.**

From Mar. 25 to May 15, 1993 a multidisciplinary cruise was conducted aboard the R/V *Nathaniel B. Palmer* as part of the Palmer Long-Term Ecological Research (LTER) program off the Antarctic Peninsula. Stations were occupied at specified grid locations within the Palmer LTER survey grid. Temperature profiles were collected using a Sippican, Inc. MK-12 expendable bathythermograph (XBT) system. The processing of

151 XBT casts is discussed; a reference list of all XBT stations is presented in a table. Graphical and tabular representations of station information and temperature measurements are presented and described.

J-51177

Smith, D.A., Smith, R.C., Menzies, D., **Oceanographic data collected aboard R/V *Nathaniel B. Palmer*, March-May 1993. Research conducted as part of the Palmer Long-Term Ecological Research program, U.S. Antarctic Research Program. *Palmer LTER. Technical report*, Dec. 1993, CCPO-TR-93-05, 265p., 5 refs.**

From Mar. 25 to May 15, 1993, a multidisciplinary cruise was conducted aboard the R/V *Nathaniel B. Palmer* as part of the Palmer Long-Term Ecological Research (LTER) program off the Antarctic Peninsula. Stations were occupied at specified grid locations within the Palmer LTER survey grid. Hydrographic data were collected on this cruise using two separate sampling devices, a Sea-Bird CTD system and a Bio-Optical Profiling System (BOPS). Eight CTD casts are appended to this BOPS report. The following reported variables were measured directly or derived from measured variables using BOPS: temperature, potential temperature, salinity, density, dynamic height, and Brunt-Väisälä frequency.

J-51178

Lascara, C.M., Smith, R.C., Menzies, D., Baker, K.S., **Oceanographic data collected aboard R/V *Polar Duke*, January-February 1993. Research conducted as part of the Palmer Long-Term Ecological Research program, U.S. Antarctic Research Program. *Palmer LTER. Technical report*, Dec. 1993, CCPO-TR-93-02, 307p., 5 refs.**

From Jan. 8-Feb. 7, 1993, a multidisciplinary cruise was conducted aboard the R/V *Polar Duke* as part of the Palmer Long-Term Ecological Research (LTER) program off the Antarctic Peninsula. Stations were occupied at specified grid locations within the Palmer LTER survey grid. Oceanographic data were collected using a Bio-Optical Profiling System (BOPS). This data report presents the following hydrographic variables which were measured directly or derived from measured variables as part of this cruise: temperature, potential temperature, salinity, density, dynamic height, and Brunt-Väisälä frequency.

J-51179

Lascara, C.M., Smith, R.C., Menzies, D., Baker, K.S., **Oceanographic data collected aboard R/V *Polar Duke*, November 1991. Research conducted as part of the Palmer Long-Term Ecological Research program, U.S. Antarctic Research Program. *Palmer LTER. Technical report*, Dec. 1993, CCPO-TR-93-01, 95p., 5 refs.**

From Nov. 7-21, 1991, a multidisciplinary cruise was conducted aboard the R/V *Polar Duke* as part of the Palmer Long-Term Ecological Research (LTER) program off the Antarctic Peninsula. Stations were occupied at specified grid locations within the Palmer LTER survey grid. Oceanographic data were collected using a Bio-Optical Profiling System (BOPS). This data report presents the following hydrographic variables which were measured directly or derived from measured variables as part of this cruise: temperature, potential temperature, salinity, density, dynamic height, and Brunt-Väisälä frequency.

J-51229

Gille, S.T., **Mean sea surface height of the Antarctic Circumpolar Current from Geosat data: method and application, *Journal of geophysical research*, Sep. 15, 1994, 99(C9), p.18,255-18,273, 40 refs.**

The mean sea surface height across the Antarctic Circumpolar Current (ACC) has been reconstructed from height variability measured by the Geosat altimeter without assuming prior knowledge of the geoid. An automated technique has been developed to estimate mean sea surface height for each satellite ground track using a meandering Gaussian jet model, and errors have been estimated using Monte Carlo simulation. The results are objectively mapped to produce a picture of the mean Subantarctic and Polar Fronts, which together comprise the major components of the ACC. The meandering jet model explains between 40 and 70% of the height variance along the jet axes. The results show that the fronts are substan-

tially steered by topography and that the jets have an average Gaussian width of about 44 km in the meridional direction and meander about 75 km to either side of their mean locations. The average height difference across the Subantarctic Front is 0.7 m and across the Polar Front 0.6 m. The mean widths of the fronts are correlated with the size of the baroclinic Rossby radius. (Auth. mod.)

J-51251

Whitworth, T., III, et al, **Weddell Sea shelf water in the Bransfield Strait and Weddell-Scotia Confluence**, *Deep-sea research*, Apr. 1994, 41(4), p.629-641, 21 refs.

The unusual stratification of the waters in the Weddell-Scotia Confluence between the Scotia and Weddell Seas and in the Bransfield Strait is traced to the influence of shelf waters from the northwestern Weddell Sea. The shelf waters span the density range encompassed by the warm, salty Circumpolar Deep Water (CDW) of the Antarctic Circumpolar Current, and the colder and slightly fresher CDW in the Weddell Sea. An isopycnal mixture of these three source waters flows eastward from the tip of the Antarctic Peninsula into the Weddell-Scotia Confluence region, and westward north of the Peninsula, where it flows downslope to renew the deep waters of the Bransfield Strait. This mixing scheme can occur year-round, in contrast to some previous explanations of the stratification in the region, which relied on the (unobserved) winter convective overturn of the water column. (Auth.)

J-51289

Pudsey, C.J., **Calibration of a point-counting technique for estimation of biogenic silica in marine sediments**, *Journal of sedimentary petrology*, July 1993, 63(4), p.760-762, 12 refs.

The technique of measuring the proportion of biogenic silica by point-counting smear slides is rapid and inexpensive and yields reproducible results on artificial known mixtures of diatom ooze and terrigenous sediment. This technique is appropriate when a very precise determination of silica is not required. The calibration curves presented here allow for correction of the point-count data according to shape and density of the biogenic particles and size distribution of the terrigenous grains. For example, for a typical ooze-mud mixture, 40% silica (area of slide) corresponds to 20-25% silica by weight. Data from Scotia Sea sediments are included. (Auth. mod.)

J-51406

Morrow, R., Coleman, R., Church, J., Chelton, D., **Surface eddy momentum flux and velocity variances in the Southern Ocean from Geosat altimetry**, *Journal of physical oceanography*, Oct. 1994, 24(10), p.2050-2071, 58 refs.

Satellite altimetry has been used to map the magnitude of the surface eddy variability of the global oceans, but the directions of the time-variable velocities have been more difficult to determine. A technique is presented for resolving both magnitude and direction of residual surface geostrophic velocities at Geosat altimeter crossover points, providing a two-year time series with a temporal resolution of 17 days and horizontal resolution of around 100 km. The time series of residual velocity components are then used to determine surface eddy statistics in the southern ocean and to investigate the role of transient eddies in the southern ocean momentum balance. The surface eddy statistics from Geosat crossover points show a complex spatial distribution in the surface Reynolds stresses. The complex spatial distribution of surface eddy momentum flux is strongly influenced by bottom topography and the position of the mean current. On a zonal average, the horizontal divergence of eddy momentum flux from transient eddies is found to be some two orders of magnitude too small to directly balance the eastward momentum from the wind. (Auth. mod.)

J-51407

Wakatsuchi, M., Ohshima, K.I., Hishida, M., Naganobu, M., **Observations of a street of cyclonic eddies in the Indian Ocean sector of the Antarctic Divergence**, *Journal of geophysical research*, Oct. 15, 1994, 99(C10), p.20,417-20,426, 18 refs.

Hydrographic and drifting buoy data from Japanese cruises show that the Antarctic Divergence in the Indian Ocean sector is composed of a street of cyclonic eddies. These eddies measure about 500 km in the zonal direction and 200 km in the meridional. Part of the eastward flowing Ant-

arctic Circumpolar Current (ACC) meanders southward in the regions between the eddies. In the eddy regions, warm, saline Circumpolar Deep Water is upwelled into the shallow layers, while cold, dense coastal water advects into the deep layers; the advection occurs along the isobaths of ridges which extend north from the coast. The combination of the advection with the upwelling produces a water column denser than the surrounding water and leads to the formation and maintenance of the cyclonic eddies. The presence of the northward extending ridges approximately governs the location of eddy formation. The eddy formation recurs yearly, although eddy locations can vary. (Auth. mod.)

J-51415

Pérez, F.F., Figueiras, F.G., Ríos, A.F., **Nutrient depletion and particulate matter near the ice-edge in the Weddell Sea**, *Marine ecology progress series*, Sep. 8, 1994, 112(1-2), p.143-153, Refs. p.151-153.

The region between Elephant I. and the South Orkney Is. was occupied by winter Weddell Sea water and a thick layer of summer and surface modified Weddell water. High correlations between nutrients (nitrate, total inorganic carbon, silicate) and oxygen with salinity were found in the upper 150 m near the ice edge. Nutrient depletion was calculated and correlated with the melting ice processes. When 1 m of ice melts, the average amount of total carbonate and nutrients removed is equivalent to a production of 33 g C/m²/yr. Increases of oxygen were detected with high rates of nutrient and carbon depletion. However, significant oxygen losses in the melting water body were estimated from the conservative 'NO' parameter. The amount of nutrients removed during pack-ice melting was about 3 times higher than that taken up in the water column. Analyses of particulate material in the ice samples showed similar C:N ratios to those estimated by the decrease of nutrients in the water column. (Auth.)

J-51433

Fahrbach, E., et al, **Suppression of bottom water formation in the southeastern Weddell Sea**, *Deep-sea research I*, Feb. 1994, 41(2), p.389-411, 50 refs.

The lack of bottom water formation in the southeastern Weddell Sea is investigated on the basis of CTD, current meter, and oxygen isotope data obtained in 1986 during the Winter Weddell Sea Project and in summer 1989 during the European Polarstern Study. The principal underlying factor in suppressing the formation of bottom water is the narrow continental shelf in the region. This leads to two consequences not obtained in the western Weddell Sea: (1) the coastal polynya is able to extend out well over deep water and over the swift-moving Antarctic Coastal Current, which acts to inhibit the accumulation of salt released by surface freezing in the polynya; and (2) the upper portions of Warm Deep Water come into close proximity with the glacial ice shelf floating above the continental shelf, thus providing heat for melting at the base of the ice shelf. Budgets for heat and salt derived from the winter data, along with measurements of $\delta^{18}\text{O}$, indicate that this melting occurs at rates more than sufficient to compensate the combined effects of brine released by freezing in the polynya and the upward flux of salt from the Warm Deep Water. As a result, the Eastern Shelf Water cannot acquire the salt concentrations needed for the formation of bottom water. (Auth.)

J-51434

Barrera, E., Keller, G., **Productivity across the Cretaceous/Tertiary boundary in high latitudes**, *Geological Society of America. Bulletin*, Oct. 1994, 106(10), p.1254-1266, 59 refs.

In low and middle latitudes, the Cretaceous/Tertiary boundary is marked by a sudden and pronounced decrease in $\delta^{13}\text{C}$ values of near-surface-water carbonates and a reduction in the surface-to-bottom $\delta^{13}\text{C}$ gradient. These isotopic data have been interpreted as evidence of a decline in surface-water productivity that was responsible for the extinction of many planktic foraminiferal species and other marine organisms at or near the K/T boundary. This paper presents planktic and benthic foraminiferal isotopic data from two almost biostratigraphically complete sections at ODP Site 738 in the antarctic Indian Ocean and at Nye Kløv in Denmark. These data suggest that planktic carbonate $\delta^{13}\text{C}$ values in high latitudes may not have decreased dramatically at the K/T boundary; thus, surface-water productivity may not have been reduced as much as in low and middle latitudes. The environmental effects of the K/T boundary may have been less severe in the high-latitude oceans than in tropical and subtropical regions. (Auth. mod.)

J-51457

Pudsey, C.J., Barker, P.F., Larter, R.D., **Ice sheet retreat from the Antarctic Peninsula shelf**, *Continental shelf research*, Dec. 1994, 14(15), p.1647-1675, 62 refs.

Side-scan sonar and sub-bottom acoustic profiler data and sediment cores reveal the processes that controlled sediment transport and deposition on the continental shelf of the Antarctic Peninsula Pacific margin off Anvers I., during deglaciation over the last 11,000 years or more. Glacial flutes and striations mark the flow of low-profile ice streams draining the interior, across the middle and outer shelf. Most probably, ice sheets were grounded to the continental shelf edge along this margin during the last glacial maximum. Iceberg furrows overwrite the ice sheet record in areas between 500 and 350 m water depth, and reflect calving from a retreating ice shelf front. Cores show open marine sedimentation replacing diamict deposition close to the grounding line during this retreat, which rapidly cleared the outer and middle shelf shortly before 11,000 years BP (from AMS ^{14}C dates on organic carbon). The shallower, scoured and largely sediment-free inner shelf cleared later, probably before 6000 years BP. (Auth. mod.)

J-51458

Zoccolillo, L., Rellori, M., **Halocarbons in antarctic surface waters**, *International journal of environmental and analytical chemistry*, 1994, Vol.55, p.27-32, 2 refs.

Surface water samples taken during the 1988-89, 1989-90 and 1990-91 Italian antarctic expeditions were analyzed for the presence of carbon tetrachloride, trichloroethylene and tetrachloroethylene. The sample analysis was carried out by solvent extraction and capillary GC-ECD-MS determination. The above-mentioned halocarbons were at ng/l levels in all water samples investigated. (Auth. mod.)

J-51472

Conference for Pacific Ocean Environments and Probing, Okinawa, Aug. 25-31, 1992, **PORSEC '92**, Shimizu, Shizuoka, Japan, PORSEC (Pacific Ocean Remote Sensing Conference) Secretariat, 1992, 1292p. (2 vols.), Refs. passim. For selected papers see 49-1072 through 49-1080, or F-51474, F-51476, F-51477, J-51473 and J-51475.

DLC GC771.C66 1992

This is the first of a series of conferences on satellite remote sensing of the Pacific Ocean. Some 200 papers were presented, and though most deal with low or mid latitudes or with the Pacific as a whole, five deal with the Arctic, and five are pertinent to Antarctica. Those pertinent to Antarctica deal with chlorophyll distribution, satellite radiometer observations of sea ice, deep convection in the Weddell Sea, disintegration of the Shirase Glacier tongue, and an ice forecasting data center.

J-51473

Mahapatra, K., Okuda, Y., Sugimori, Y., **CZCS derived chlorophyll distribution in antarctic water during austral summer**, Conference for Pacific Ocean Environments and Probing, Okinawa, Aug. 25-31, 1992. **PORSEC '92**. Proceedings. Vol.1, Shimizu, Shizuoka, Japan, PORSEC (Pacific Ocean Remote Sensing Conference) Secretariat, 1992, p.313-318, 16 refs.

Near-surface chlorophyll concentrations derived from CZCS (Coastal Zone Color Scanner) imaging covering the area between the south Drake Passage and the Antarctic Peninsula are broadly in agreement with *in situ* values obtained during FIBEX investigations in the same area during austral summer in 1981. The results validate the applicability of satellite data to identify mesoscale pigment distribution patterns in the south polar region.

J-51475

Akitomo, K., Awaji, T., Imasato, N., **Numerical study of deep convection at high latitudes**, Conference for Pacific Ocean Environments and Probing, Okinawa, Aug. 25-31, 1992. **PORSEC '92**. Proceedings. Vol.2, Shimizu, Shizuoka, Japan, PORSEC (Pacific Ocean Remote Sensing Conference) Secretariat, 1992, p.645-650, 18 refs.

Numerical experiments have been carried out to investigate the formation process and the properties of deep convection in the Weddell Sea. The thermobaric effect, i.e. the increase in value of the thermal expansion coefficient of sea water with pressure (depth) at low temperatures, makes the mixed layer unstable, and deep convection catastrophically occurs as a "thermal" plume. As the colder (less-saline) mixed-layer water intrudes into the warmer (more-saline) underlying layer, the thermocline (halocline) at the base of the mixed layer gradually ascends to disappear at the sea surface. It takes only a few days for the thermocline to disappear if the sea surface is not covered with ice. On the other hand, it takes more than 20 days owing to the reduction of cooling rate if the sea surface is covered with ice. The latter implies that the vertical transport of heat and materials will be modified in the interannual time scale by such a moderate overturning process.

J-51492

Gammelsrød, T., **Water mass distribution and tides along the Filchner-Ronne Ice Shelf. Preliminary results from the Norwegian Antarctic Expedition 1992/93**, *Filchner-Ronne Ice Shelf Programme (FRISP). Report*, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.42-45.

DLC G890.F55R47 No.7 1994

The southwestern Weddell Sea is normally hard to access due to heavy sea ice conditions. During the survey presented here an oceanographic section was obtained along both the Ronne and Filchner Ice Shelves all the way to the Antarctic Peninsula. In addition to the traditional CTD-data, a major chemical observation program was introduced on this expedition, including measurements of oxygen, nutrients, the carbonate system, CFC, tritium, helium-3, and O-18. Some of the observational results are presented here in graph form. Several stations were also obtained on the shallow shelf north of Berkner I., in addition to a few stations on the continental slope at 74S.

J-51493

Robinson, A., Mackinson, K., **Ocean circulation beneath Ronne Ice Shelf**, *Filchner-Ronne Ice Shelf Programme (FRISP). Report*, 1994, No.7, International Workshop on the Filchner-Ronne Ice Shelf Programme (FRISP), 8th, June 1993. H. Oerter, comp., p.47-52, 6 refs.

DLC G890.F55R47 No.7 1994

The first and most important result of this work is the discovery that Western Shelf Water (WSW) can penetrate 200 km underneath Ronne Ice Shelf without undergoing modification. This has implications for the modelling of the sub-ice circulation regime. The next result is that there are significant tidal currents at this site. This was surprising because there was no indication of tidal activity at a previous drill site 100 km to the south, and because normally, strong tidal currents would generate mixing within the column. The last result is the variability in the water column which recurs periodically, especially with different temperatures in Ice Shelf Water (ISW) being seen. Given that ISW emerges at the ice front as separate plumes, it is suggested that this indicates that more than one plume flows from the vicinity of the drill site within the Ronne Depression, and that some roughly periodic motion is bringing water from the plumes, or the plumes themselves beneath the drill site. (Auth. mod.)

J-51495

Marschall, R.A., Stinson, D.L., Pearce, R.E., Boyer, E., Embry, B., **Use of an innovative solid towed array for exploring the antarctic marine environment**, Oceans'93 Conference, Victoria, British Columbia, Oct. 18-21, 1993. Proceedings. Vol.2, New York, Institute of Electrical and Electronics Engineers, 1993, p.II35-II40, 5 refs.

A recent marine seismic survey conducted in the Antarctic gathered data using a variable diameter solid towed hydrophone array. This array placed each polyvinylidene fluoride hydrophone forward in a hydrodynamically shaped housing designed to maintain laminar fluid flow along most of its length and to prevent boundary layer separation for the remainder. The sensors were external to the strain bearing members. Individual hydrophones enclosed in the hydrodynamic casings were connected in a sequential array by a cable of small diameter encased in flexible soft polyurethane, resulting in a very small average diameter array. This compact,

robust towed hydrophone array was well-suited to antarctic exploration where (1) the levels of ambient noise could range from Knudsen Sea State 4 down to below Sea State Zero, (2) array repair would be extraordinarily difficult, and (3) oil-filled array leakage would be particularly damaging to this unique and pristine environment. (Auth.)

J-51497

Hovine, S., Fichefet, T., **Zonally averaged, three-basin ocean circulation model for climate studies**, *Climate dynamics*, Sep. 1994, 10(6-7), p.313-331, 59 refs.

A two-dimensional, three-basin ocean model suitable for long-term climate studies is developed. The model is based on the zonally averaged form of primitive equations written in spherical coordinates. The east-west density difference which arises upon averaging the momentum equations is taken to be proportional to the meridional density gradient. Lateral exchanges of heat and salt between the basins are explicitly resolved. Moreover, the model includes bottom topography and has representations of the Arctic Ocean and of the Weddell and Ross seas. Under realistic restoring boundary conditions, the model reproduces the global conveyor belt: deep water is formed in the Atlantic between 60 and 70N at a rate of about 17 Sv in the vicinity of the antarctic continent, while the Indian and Pacific basins show broad upwelling. A series of perturbation experiments illustrates the ability of the model to reproduce different steady-state circulations under mixed boundary conditions. Finally, the model sensitivity to various factors is examined. This sensitivity study reveals that the bottom topography and the presence of a submarine meridional ridge in the zone of the Drake Passage play a crucial role in determining the properties of the model bottom-water masses. (Auth. mod.)

J-51507

Arcilla, A.S., García, M.A., **Study of water dynamics of the Bransfield Strait. Methodology** [Investigación de la dinámica marina en el Estrecho de Bransfield. Planteamiento metodológico], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.57-63, In Spanish with English summary. 12 refs.

The main goals and strategy of the 1991-1994 project "Oceanografía Dinámica del Estrecho de Bransfield" are discussed as regards present state-of-the-art knowledge. The proposed research methodology combines in situ data acquisition during oceanographic surveys and use of moored instruments with numerical modelling and processing of satellite imagery. The launch of this project is regarded as an attempt to start a long-term research program in antarctic oceanography. (Auth.)

J-51508

García, M.A., et al, **Propagation of wind generated waves in Miles Bay** [Propagación de olas de viento en Bahía Sur, Isla Livingston], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.65-73, In Spanish with English summary. 4 refs.

During the 1990-1991 expedition of the National Spanish Programme on Antarctic Research, a Waverider buoy was operated in Miles Bay, Livingston I. The acquired information has been used for preliminary assessment of the local summer wave climate, which will be further updated with additional field research. (Auth.)

J-51509

Espino, M., et al, **Estimate of wind induced circulation in Miles Bay** [Estima de la circulación inducida por el viento en Bahía Sur], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.75-86, In Spanish with

English summary. 3 refs.

Time series of meteorological data have been collected at the Juan Carlos I Station since 1987. These data allow quantification of the local mean wind climate, which may be generalized for the entire Miles Bay area. A numerical study on the effect of representative wind stress distribution on the local circulation has been performed using a quasi-3D finite element code which solves the steady-state, shallow water of the Navier-Stokes equations. Preliminary results are coherent with some of the visual observations carried out during the 1990-91 expedition. Regarding further quantitative validation of the numerical solutions, field data of current velocities are required to provide field truth and to support both the assessment of boundary conditions and the tuning of the model coefficients. (Auth.)

J-51510

Prego, R., **Dissolved silicate in antarctic frontal zones during BIOMASS-IV and SUZIL-91 campaigns** [El silicato disuelto en las zonas frontales antárticas investigadas durante las campañas BIOMASS-IV y SUZIL-91], Actas del cuarto Simposio Español de Estudios Antárticos, Puerto de la Cruz, 20-25 de octubre de 1991. (Spanish Symposium on Antarctic Studies, 4th, Puerto de la Cruz, Oct. 20-25, 1991. Proceedings). Edited by J. Castellví, Madrid, Comisión Interministerial de Ciencia y Tecnología, 1991, p.87-94, In Spanish with English summary. 16 refs.

Antarctic frontal zones surveyed during BIOMASS-IV (Weddell-Scotia Confluence) and SUZIL-91 (Subtropical and Antarctic Confluences in the Indian sector) cruises showed a strong gradient of silicate associated with the confluences. Its position coincides with the 2 micron silicate isoline in the Indian sector, and 70 microns in the Atlantic sector. Dissolved silicate is considered to be a good tracer of frontal zones and of the changes occurring in them, due to good silicate-salinity correlation in the antarctic water masses.

J-51549

Howard, W.R., Prell, W.L., **Late Quaternary CaCO₃ production and preservation in the southern ocean: implications for oceanic and atmospheric carbon cycling**, *Paleoceanography*, June 1994, 9(3), p.453-482, Refs. p.479-482.

Recent geochemical models invoke ocean alkalinity changes, particularly in the surface southern ocean, to explain glacial age $p\text{CO}_2$ reduction. In such models, alkalinity increases in glacial periods are driven by reductions in North Atlantic Deep Water (NADW) supply, which lead to increases in deep-water nutrients and dissolution of carbonate sediments, and to increased alkalinity of Circumpolar Deep Water upwelling in the surface southern ocean. The authors use cores from the Southeast Indian Ridge and from the deep Cape Basin in the South Atlantic to show that carbonate dissolution was enhanced during glacial stages in areas now bathed by Circumpolar Deep Water. This suggests that deep southern ocean carbonate ion concentrations were lower in glacial stages than in interglacials, rather than higher as suggested by the polar alkalinity model. Results show that changes in southern ocean CaCO₃ preservation are coherent with changes in the relative flux of NADW, suggesting that southern ocean carbonate chemistry is closely linked to changes in deep-water circulation. (Auth. mod.)

J-51558

McTaggart, A., Burton, H., **Aspects of biogeochemistry of dimethylsulfide (DMS) and dimethylsulfoniumpropionate (DMSP) at an antarctic coastal site**, International Symposium, Belgirate, Italy, Oct. 13-15, 1992. Proceedings. Dimethylsulfide: oceans, atmosphere and climate, edited by G. Restelli and G. Angeletti and Air Pollution Research Report 43, Dordrecht, Kluwer Academic Publishers, 1993, p.43-52, 17 refs.

DLC QC879.6.D56

The influence of the summer stratification and increased primary productivity in the antarctic coastal water column on the production of dimethylsulfide (DMS) and dimethylsulfoniumpropionate (DMSP) was determined. Differences in sample handling procedure resulted in DMS concentration changing by a factor of 2.75. The ratio of dissolved DMSP and DMS was maintained at ca. 2.0 during winter and summer. The Dec.

summer thermocline divided the production of DMSP into two zones. DMSP was closely related to the increase in *Phaeocystis pouchetii* pigments in both zones whereas DMS was only closely related below the base of the thermocline. (Auth.)

J-51560

Staube, R., Georgii, H.W., **Measurements of atmospheric and seawater DMS concentrations in the Atlantic, the Arctic and antarctic region**, International Symposium, Belgirate, Italy, Oct. 13-15, 1992. Proceedings. Dimethylsulphide: oceans, atmosphere and climate, edited by G. Restelli and G. Angeletti and Air Pollution Research Report 43, Dordrecht, Kluwer Academic Publishers, 1993, p.95-102, 14 refs.

DLC QC879.6.D56

This paper reports on simultaneous measurements of dimethyl sulfide in surface seawater and the overlying atmosphere in several hydrographical areas of the world's oceans in a latitudinal range between 82N and 71S. As DMS is produced biologically in seawater, the concentrations of dissolved DMS show a reasonable seasonal and spatial variability with values ranging from 10 to 1600 ngS(DMS)/l. Maximum values were measured in highly productive upwelling and shelf areas of the temperate and high latitudes. In oligotrophic waters the concentrations varied between 5 and 60 ngS/l. The DMS mixing ratios in the marine boundary layer showed a reasonable temporal and spatial variability, with values ranging from 3 to 3400 pptv depending on sea-to-air flux rates and the meteorological situation. Aerosol methane sulfonate (MSA) and non-sea salt sulfate (nss sulfate) concentrations ranged from 3 to 60 ppt and 44 to 270 ppt, respectively, in a latitudinal range between 50N and 71S. The ratios of nss sulfate to MSA measured in high southern latitudes were generally lower than those observed in temperate and tropical marine areas. (Auth. mod.)

J-51566

Speer, K.G., Forbes, A., **Deep western boundary current in the South Indian Basin**, *Deep-sea research I*, Sep. 1994, 41(9), p.1289-1303, 15 refs.

A section of closely-spaced hydrographic stations was occupied for the first time across the western boundary of the South Indian Basin, above the flank of the Kerguelen Plateau. A northward-flowing deep boundary current was found, whose transport is estimated geostrophically to be $6 \times 10^6 \text{ m}^3/\text{sec}$. The section crossed meanders of fronts within the Antarctic Circumpolar Current, with transports estimated as $5\text{-}15 \times 10^6 \text{ m}^3/\text{sec}$. The source of bottom water is concluded to be the neighboring antarctic shelf, including the Adélie Coast and a component from the Ross Sea. Changes in the deep temperature-salinity relation are consistent with an increased component of relatively salty bottom water from the Ross Sea, over the time period 1972-1992. (Auth. mod.)

J-51579

Hay, W.W., **Role of polar deep water formation in global climate change**, *Annual review of earth and planetary sciences*, 1993, Vol.21, p.227-254, 74 refs.

DLC QE1.A674

The processes and conditions under which deep water is formed in the open ocean and on continental shelves are reviewed. Favored locations in both arctic and antarctic regions are identified and characterized as being few in number, small in size, but strong in influence. Research milestones in which the controlling mechanisms were identified and described are highlighted. Significant deep water formation processes between continental shelf and open ocean are compared and contrasted, and the dominant influence of sea water temperature and chemistry is explained.

J-51580

Shemesh, A., Burckle, L.H., Hays, J.D., **Meltwater input to the southern ocean during the last glacial maximum**, *Science*, Dec. 2, 1994, 266(5190), p.1542-1544, 25 refs.

Three records of oxygen isotopes in biogenic silica from deep-sea sediment cores from the Atlantic and Indian sectors of the southern ocean reveal the presence of isotopically depleted diatomaceous opal in sediment from the last glacial maximum. This depletion is attributed to the presence of lids of meltwater that mixed with surface water along certain trajectories in the southern ocean. An increase in the drainage from Antarctica or extensive northward transport of icebergs are among the main mecha-

nisms that could have produced the increase in meltwater input to the glacial southern ocean. Similar isotopic trends were observed in older climatic cycles at the same cores. (Auth.)

J-51581

Larson, R.L., Ingram, B.L., Richter, F.M., **Strontium isotopes in mid-Cretaceous seawater**, *Science*, Dec. 2, 1994, 266(5190), p.1584-1586, 20 refs. For the paper being discussed see J-51582.

Larson takes issue with Ingram and Richter et al. as to the increase of oceanic crustal production being the cause of a general decrease in Sr at the mid-Cretaceous time period. He declares the comparison to be akin to comparing apples to apples and oranges. Ingram and Richter respond that their conclusion would have remained the same had they considered only the extrusive part of oceanic crustal production; that Larson mistakes the calculated percentages of increase in crustal production rates; and that using the ocean crustal production rates suggested by Larson, other factors being unchanged, would produce a decrease in $^{87}\text{Sr}/^{86}\text{Sr}$ of seawater five times larger in amplitude and five times longer in duration than what is observed.

J-51582

Ingram, B.L., Coccioni, R., Montanari, A., Richter, F.M., **Strontium isotopic composition of mid-Cretaceous seawater**, *Science*, Apr. 22, 1994, 264(5158), p.546-550, 39 refs. For a critique of and response to this paper see J-51581.

The $^{87}\text{Sr}/^{86}\text{Sr}$ ratio in fish teeth separated from mid-Cretaceous marl and black shale from the northeastern Apennines and Venetian Alps (Italy) define three periods of low $^{87}\text{Sr}/^{86}\text{Sr}$ ratio at 121 to 124 Ma, 110 to 115 Ma, and 89 to 91 Ma. The $^{87}\text{Sr}/^{86}\text{Sr}$ excursions correspond to oceanic anoxic events represented by the Livello Selli, Livello 113, Livello Urbino, and Livello Bonarelli black shale marker beds and probably reflect an increase in the low $^{87}\text{Sr}/^{86}\text{Sr}$ hydrothermal strontium flux associated with the emplacement of the Ontong-Java and Kerguelen plateaus (120 to 110 Ma) and the Caribbean Plateau (89 to 91 Ma). The modeled flux is consistent with the volumes and eruption rates of the oceanic plateaus but is far smaller than expected from the proposed Cretaceous crustal production rates of 50 to 100% greater than modern. (Auth.)

J-51584

O'Carroll, R.H., **Analysis of eddy resolving global ocean models in the southern ocean**, Monterey, CA, Naval Postgraduate School, 1994, 134p., ADA 283-211, 48 refs.

Comparisons between the two model runs, a half-degree resolution and a quarter-degree resolution of the Semtner-Chervin eddy-resolving global ocean model, and the Hydrographic Atlas of the Southern Ocean observations are conducted by analyzing horizontal and vertical sections. The quarter-degree model, employing a Mercator grid, was interpolated forward from the half-degree model initialization. For the last three years of the model run time, the resolution was improved to 0.25 deg on average and ECMWF winds were used. Also, no deep restoring in the last three years is introduced into the model. Another difference between the half-degree model and the quarter-degree model is that in the latter, the bathymetry is unsmoothed, so that not only is the resolution finer, but the topography is more realistic. The model is shown to produce very realistic circulation and temperature and salinity distributions. Volume transport and meridional volume and heat transports are also calculated. The quarter-degree model shows marked improvement over the half-degree model although both models have salinities to the south and near the surface which are higher than those observed. This could be due to errors in surface flux parameterizations. (Auth.)

J-51586

Livermore, R., McAdoo, D., Marks, K., **Scotia Sea tectonics from high-resolution satellite gravity**, *Earth and planetary science letters*, May 1994, 123(1-4), p.255-268, 34 refs.

The Scotia Sea is an outstanding example of back-arc spreading, which is revealed in some detail by free-air gravity anomaly maps derived from the latest release of data acquired south of 30S. Sea surface height data for this region have been reduced to a grid of free-air gravity anomalies, and are illustrated here by means of color shaded relief and contour maps. The new data confirm the existence of a number of inactive spreading ridges within the Scotia Sea and surrounding small basins. The ampli-

tudes and wavelengths of gravity anomalies over these ridges conform, in general, to the expected relationship with spreading rate, except in the central Scotia Sea, where a proposed Miocene slow-spreading ridge appears to have left no clear signature. The spreading ridge axis in the east Scotia Sea comprises seven or more segments, separated by small, mainly sinistral, offsets and exhibits a median valley with depths of 200-1000 m that is reflected in free-air lows of 10-40 mGal. Near both its northern and southern termini, the gravity signature of the ridge becomes less distinct, with a less pronounced axial low. The northernmost segments of the ridge are displaced in a right-lateral sense by a feature which appears to represent a southward migrating non-transform offset. Whereas the process of spreading in Drake Passage and the east Scotia Sea was comparable to mid-ocean ridges, that in the central Scotia Sea may have been disorganized, as observed in some western Pacific back-arc basins. (Auth. mod.)

J-51614

Brandini, F.P., Rebello, J., **Wind field effect on hydrography and chlorophyll dynamics in the coastal pelagial of Admiralty Bay, King George Island, Antarctica**, *Antarctic science*, Dec. 1994, 6(4), p.433-442, Refs. p.441-442.

The vertical distribution of physicochemical parameters and Chl *a* at a fixed station in Admiralty Bay was recorded over 73 days during the summer of 1988-89. Temporal variations in Chl *a* and nutrient stocks in the euphotic zone were associated with changes in the wind/hydrological regime. Northerly winds of late Dec. and early Jan. moved the surface layers towards the outer bay, during which time the chlorophyll stocks remained low in the euphotic zone. Turbulence induced by southerly winds in the second half of Jan. resuspended sediments and benthic diatoms in the shallow (0-20 m) inner inlets of the bay, increasing turbidity and nutrient concentrations at the surface. During the first half of Feb. wind relaxation caused the mass sedimentation of previously resuspended benthic diatoms, increasing chlorophyll and phaeopigments in the subsurface layers in deeper sections of the bay. Although turbulence limits phytoplankton biomass accumulation in open waters of the Antarctic, it may have a positive effect (increasing chlorophyll biomass of benthic origin) in coastal pelagic environments during late summer. (Auth.)

J-51615

Fenton, N., Priddle, J., Tett, P., **Regional variations in bio-optical properties of the surface waters in the southern ocean**, *Antarctic science*, Dec. 1994, 6(4), p.443-448, 30 refs.

Values of attenuation coefficient, $K_d(\lambda)$, for 5 visible wavelengths are reported for 14 sites around South Georgia and the Bransfield Strait. The mean chlorophyll-plus-phaeopigment concentrations in the upper 30 m of the water column ranged from 0.32-6.633 mg/m³ with one particularly high mean value of 31 mg/m³. Partition of attenuation between chlorophyll (K_c) and other factors in the water column (K_0) indicated that the spectral character of K_0 in the Bransfield Strait was consistent with absorption by non-chlorophyll-like pigments (Gelbstoff). Values were significantly different between the two areas. Values of the specific attenuation coefficient due to pigment concentration (K_c) were small compared to temperate values. These data support other studies in suggesting that the application of remotely sensed ocean color data to global biogeochemical surveys requires the development of regional algorithms. (Auth.)

See also:

A-50288 A-50821 A-51483 B-49614 B-49617 B-49622 B-49634
B-49638 B-49659 B-49714 B-49843 B-50005 B-50072 B-50074
B-50075 B-50076 B-50077 B-50078 B-50079 B-50080 B-50082
B-50083 B-50085 B-50086 B-50090 B-50092 B-50130 B-50193
B-50256 B-50304 B-50311 B-50320 B-50325 B-50329 B-50360
B-50383 B-50412 B-50444 B-50459 B-50460 B-50461 B-50479
B-50544 B-50545 B-50546 B-50550 B-50552 B-50558 B-50560
B-50593 B-50618 B-50621 B-50647 B-50648 B-50655 B-50656
B-50830 B-50831 B-50834 B-50837 B-50862 B-50865 B-50869
B-50962 B-50963 B-50964 B-50965 B-51016 B-51017 B-51018
B-51019 B-51020 B-51021 B-51024 B-51025 B-51029 B-51031
B-51046 B-51053 B-51054 B-51056 B-51130 B-51141 B-51163
B-51175 B-51317 B-51398 B-51399 B-51400 B-51413 B-51431
B-51469 B-51557 B-51565 B-51618 B-51642 C-49546 C-49834
C-50954 C-51035 C-51139 D-49509 D-51309 E-49730 E-49881
E-50131 E-50222 E-50232 E-50234 E-50235 E-50240 E-50241

E-50242 E-50243 E-50270 E-50272 E-50338 E-50341 E-50371
E-50426 E-50824 E-51002 E-51203 E-51215 E-51305 E-51325
E-51330 E-51331 E-51333 E-51337 E-51345 E-51347 E-51357
E-51364 E-51372 F-49542 F-49582 F-49645 F-49884 F-49910
F-49912 F-49913 F-49919 F-50153 F-50164 F-50167 F-50168
F-50305 F-50351 F-50381 F-50535 F-50543 F-50606 F-50929
F-51068 F-51282 F-51486 G-50605 G-51397 I-49556 I-49911
I-50049 I-50050 I-50361 I-50694 I-50709 I-50876 I-50879
I-50949 I-50953 I-51137 I-51224 I-51301 I-51556 L-49669
M-50852

K. ATMOSPHERIC PHYSICS

K-49508

Popecki, M., Arnoldy, R., Engebretson, M.J., Cahill, L.J., Jr., **High-latitude ground observations of Pc 1/2 micropulsations**, *Journal of geophysical research*, Dec. 1, 1993, 98(A12), p.21,481-21,491, 39 refs.

A ground-based survey of Pc 1/2 (0.1-0.4 Hz) and Pc 1 micropulsations at Amundsen-Scott, Sondre Stromfjord and Siple Stations in 1986 provided evidence for the location of the Pc 1/2 source region. The study revealed a diurnal occurrence pattern for waves in the 0.1-0.4 Hz band (Pc 1/2) and showed that the pattern was not due to the effects of sunlight on the ionosphere, but originated from a postnoon magnetospheric source. On the basis of the latitudinal occurrence patterns of the waves above and below 0.4 Hz, it is concluded that the waves observed on ground above 0.4 Hz come primarily from plasmopause latitudes, while the source of the Pc 1/2 lies between the plasmopause and the magnetopause. The estimate of source locations for waves above and below this frequency, combined with the typically sharp upper frequency limit of waves in the 0.1-0.4 Hz band (Pc 1.2), are interpreted as evidence that He⁺ ions in the outer magnetosphere influence propagation and possibly wave growth. (Auth. mod.)

K-49562

Piccirillo, L., Calisse, P., **Measurements of cosmic background radiation anisotropy at intermediate angular scale**, *Astrophysical journal*, July 10, 1993, 411(2, Part 1), p.529-533, 18 refs.

Results from an antarctic ground-based experiment devoted to the search for fluctuations in the cosmic background radiation (CBR) are presented. The authors have developed an off-axis telescope with a Gaussian beam response of 50' FWHM and with a beam-throw adjustable from 0 to 2 deg. The detector was a ³He bolometer working at 0.35 K and operating at 2.2 mm wavelength. The data collected show evidence of fluctuations at a level of $\Delta T_{rms}/T = 4.5 \times 10^{-5}$ at an angular scale of 40'. The expected fluctuations obtained by extrapolating the COBE result down to this angular scale, in a cold dark matter scenario, are a factor of 2.5 lower (1.8×10^{-5}). If residual systematics effects or cold galactic dust emission are responsible for the signal detected, this result should be considered as an upper limit to CBR anisotropy. (Auth. mod.)

K-49587

Du, J.H., Sun, X.R., Wang, J.J., **Comparisons between HF sky wave field strength measurements and predictions made by Report 894-2 of CCIR**, *Antarctic research (Chinese edition)*, 1993, 5(3), p.55-59, In Chinese with English summary. 11 refs.

The comparisons between HF sky wave field strength measurements and predictions made by Report 894-2 of CCIR showed that the mean difference and standard deviation are -4.7dB and 13.5dB respectively. The reasons for the deviation between measurements and predictions have been analyzed. The authors have evaluated the prediction method for path lengths greater than 9,000 km involved in Report 894-2 of CCIR, and point out that the predictions are too low compared with measurements and the antipode focus formula should be modified. The prediction accuracy of Report 894-2 of CCIR would then be improved. (Auth.)

K-49599

Zong, Q.G., Ye, Z.H., Xue, B.S., Ye, X.W., **Influence of cosmic ray Forbush decrease of the low ionosphere in the polar region**, *Antarctic research (Chinese edition)*, 1993, 5(2), p.21-27, In Chinese with English summary. 14 refs.

Based on the ionization theory of cosmic ray polar ionosphere, the relationship between Forbush decrease and cosmic noise absorption during the polar night is analyzed. From riometric data recorded at the Zhongshan Station, it is concluded that the influence of cosmic ray Forbush decrease on cosmic noise absorption is well interpreted by the above theory. (Auth. mod.)

K-49605

Górski, K.M., Stompor, R., Juszkiewicz, R., **Cold dark matter and degree-scale cosmic microwave background anisotropy statistics after COBE**, *Astrophysical journal*, June 10, 1993, 410(1), p.L1-L5, 26 refs.

The authors conduct a Monte Carlo simulation of the cosmic microwave background (CMB) anisotropy in the UCSB South Pole 1991 degree-scale experiment. They examine cold dark matter cosmology with large-scale structure seeded by the Harrison-Zel'dovich hierarchy of Gaussian-distributed primordial inhomogeneities normalized to the COBE-DMR measurement of large-angle CMB anisotropy. The authors find it statistically implausible (in the sense of low cumulative probability $F < 5\%$ of not measuring a cosmological $\Delta T/T$ signal) that the degree-scale cosmological CMB anisotropy predicted in such models could have escaped detection at the level of sensitivity achieved in the South Pole 1991 experiment. (Auth.)

K-49623

Rosenberg, T.J., et al, **Imaging riometer and HF radar measurements of drifting F region electron density structures in the polar cap**, *Journal of geophysical research*, May 1, 1993, 98(A5), p.7757-7764, 22 refs.

A study of riometer, photometer, and ionosonde data from Amundsen-Scott Station has revealed a class of unusual dayside absorption events which occur near local magnetic noon when South Pole is located poleward of the dayside cusp. These events, which can reach values in excess of 1 dB in narrow-beam 38.2 MHz riometer measurements, are accompanied by significant enhancement of the O(¹D₂) 630.0 nm emission. However, because there is no corresponding change in the N₂⁺ 427.8 nm emission, it is unlikely that these events are caused by the conventional D or lower E region ionization increases usually attributed to the precipitation of auroral electrons of keV energy. Rather, the comparison of South Pole imaging riometer and ionosonde data with simultaneous Halley PACE HF radar data suggests that these unusual absorption events are related to F region electron density structures drifting from the dayside oval into the polar cap. If further work sustains this interpretation, then new prospects will be opened up for using imaging riometers to examine aspects of polar cap convection. (Auth.)

K-49624

Deng, W., et al, **Effects of neutral inertia on ionospheric currents in the high-latitude thermosphere following a geomagnetic storm**, *Journal of geophysical research*, May 1, 1993, 98(A5), p.7775-7790, Refs. p.7789-7790.

Results of an experimental and theoretical investigation into the effects of the time dependent neutral wind flywheel on high-latitude ionospheric electrodynamics are presented, including the following conclusions: neutral winds can contribute significantly to the horizontal ionospheric current system in the period immediately following the main phase of a geomagnetic storm, especially over the magnetic polar cap and in regions of ion drift shear; they drive Hall currents that flow in the opposite direction to those driven by ion drifts. The overall morphology of the calculated field-aligned current system agrees with previously published observations for the interplanetary magnetic field (IMF) B(Z) southward conditions, although the region 1 and region 2 currents are smeared by the TIGCM model grid resolution. Neutral winds can make significant contributions to the field-aligned current system when B(Z) northward conditions prevail following the main phase of a storm, but can account for only a fraction of the observed currents. DE 2 measurements provide a demonstration of "local" (satellite-altitude) flywheel effects. On the assumption that the magnetosphere acts as an insulator, the authors calculate neutral-wind-induced polarization electric fields of about 20-30 kV in the period immediately following the geomagnetic storm. (Auth. mod.)

K-49663

Troshichev, O.A., Gusev, M.G., IMF B_x and B_y dependencies of the polar cap auroral distribution for northward IMF orientation inferred from observations at Vostok Station, *Journal of atmospheric and terrestrial physics*, Feb. 1994, 56(2), p.237-244, Refs. p.243-244.

The effects of the IMF radial (B_x) and azimuthal (B_y) components on the distribution of polar cap arcs are examined using all-sky camera data from Vostok Station for the winter months of 1977-1985. It is concluded that 3 factors control the character of auroral distribution: the type of the sector structure, the IMF radial component, and the IMF azimuthal component. Based on experimental results, the scheme for auroral distribution in the northern and southern polar caps for different signs of B_x and B_y is put forward. The B_x component determines the intensity of aurorae in the polar cap where geomagnetic field lines are in the opposite direction to the IMF ($B_x < 0$ in the case of the northern cap, and $B_x > 0$ for the southern cap) and produces the daytime auroral belt poleward of the auroral oval and parallel to it. The B_y component affects the auroral appearance in the morning or evening sectors of the polar cap, depending on its sign, and acts asymmetrically in the opposite polar cap. The appropriate patterns of plasma filament distributions in high-latitude tail lobes are proposed. The characteristics of auroral movements affected by the B_y component (such as the direction and speed of the arc motion and the magnitude of displacements) are examined. (Auth. mod.)

K-49674

Ondoh, T., Narrow-band plasmopause hiss observed by ISIS satellites, *Radio science*, July-Aug. 1993, 28(4), p.629-642, 31 refs.

Typical frequency-time spectra of narrow-band hiss obtained near plasmopause latitude from ISIS VLF electric field data (50 Hz to 30 kHz), telemetered at Showa Station under quiet conditions, are similar to those of narrow-band 5 kHz hiss observed at mid-latitudes and low-latitudes on the ground. This hiss in the topside ionosphere first appeared as a thin, bar-shaped emission around 5 kHz at geomagnetic invariant latitude of about 56 deg and grew into a wider band between 3 and 6 kHz at invariant latitudes around 60 deg, which is the average plasmopause latitude. At higher latitudes the band narrowed somewhat and disappeared around 65 deg. The hiss had no lower-frequency cutoff, and its center frequency remained approximately constant at 5 kHz, between about 56 and 65 deg. This narrow-band hiss is completely different from the electrostatic LHR hiss which is also observed above the ionosphere with an electric antenna, but which has latitude-dependent lower-frequency cutoff. Since the narrow-band 5 kHz hiss occurs often around plasmopause latitude (60 deg), hereafter the author calls this hiss narrow-band plasmopause hiss. Latitude and local time distributions of the occurrence rate for narrow-band plasmopause hiss were obtained by analyzing six-frequency narrow-band data processed from the wideband VLF signals received at Showa Station from ISIS 1 and ISIS 2 during 507 passes between Dec. 1976 and Jan. 1983. (Auth. mod.)

K-49704

Crickmore, R.I., Comparison between vertical winds and divergence in the high-latitude thermosphere, *Annales geophysicae*, Aug. 1993, 11(8), p.728-733, 20 refs.

Measurements of thermospheric wind velocities obtained from a Fabry-Perot interferometer (FPI) situated at Halley Station have been used to compare the vertical wind with the divergence of the horizontal flow at an altitude of approximately 240 km. The ratio between vertical wind and divergence is of the order of five times that predicted by a theoretical model. The likely causes of this discrepancy are discussed. A scale size of approximately 360 km for the vertical wind at this high latitude site is suggested by the results. (Auth.)

K-49823

Arriagada M., M.A., Foppiano B., A.J., Figueroa M., D.E., Daily variations of foF2, hmF2 and ymF2 at King George I. during the geomagnetic storm of June 1991 [Variaciones diarias de la foF2, hmF2, e ymF2 en isla Rey Jorge, Antártica, durante la tormenta geomagnética del 4-6 de junio de 1991], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1993, No.43, p.9-16, In Spanish with English summary. \$11 refs.

Daily variations of foF2, hmF2 and ymF2 have been determined using ionograms recorded at 15 minute intervals for all days of June 1991 at Marsh Station. Values of hmF2 and ymF2 were derived from those corresponding to foF2, M(3000)F2, foE and h'F, F2 using empirical formulae adopted by the International Radio Consultative Committee. Variations for June 4-6 are compared with those corresponding to a selected quiet period (June 14, 16, 27, 28 and 29). Large differences found between geomagnetically disturbed and quiet values are discussed, taking into account possible inaccuracies of determined values and significant trends observed. (Auth. mod.)

K-49827

Foppiano B., A.J., F-region critical frequency over King George I. [Frecuencia crítica de la región F de la ionosfera sobre la isla Rey Jorge, Antártica], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1993, No.43, p.67-72, In Spanish with English summary. 7 refs.

Observed values of monthly-median ionospheric F-region critical frequency for King George I. are compared with those determined using the International Radio Consultative Committee model. Hourly values measured at Rodolfo Marsh Station are used, corresponding to Mar., June, Sep., and Dec. of 1986 and 1989, representative of both low and high solar activity levels. Systematic differences are found between observed values and those determined using the model for both low and high solar activity levels, particularly for summer, a season for which the model does not adequately account for diurnal variations. (Auth.)

K-49832

Cordaro C., E., Southern Hemisphere network of the antarctic laboratory for cosmic radiation [Laboratorio antártico de radiación cósmica y su red hemisférica sur], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1993, No.43, p.111-132, In Spanish with English summary. 20 refs.

The Antarctic Laboratory for Cosmic Radiation (LARC) has been operating at King George I., Fildes Bay, and Ardley Cove since Jan. 1991. In Jan. 1992 its electronic and data acquisition system was changed to a digital one. Its present status is described, giving a report of available data, including information related to the proposed implementation of the LARC research program and the linkage with the Southern Monitor network in the 60-70W meridian zone. (Auth.)

K-49888

Greet, P.A., Jacka, F., Analysis of high-resolution mesospheric sodium twilight spectral emission profiles, *Journal of atmospheric and terrestrial physics*, Apr. 1994, 56(5), p.603-616, 17 refs.

High-resolution Fabry-Perot spectrometers were used at Mawson Station for observations of mesospheric sodium spectral emissions excited by resonant scattering of sunlight. These observations are used to estimate winds and temperatures in the emission region. Hollow-cathode lamps have been used to define the rest wavelength for calculation of wind estimates from the Doppler shift of sky emission. Careful analysis of both lamp and sky spectra show the presence of self-absorption. The nature of the absorption is different for lamp and sky profiles; in the former case absorption occurs after emission, and in the latter absorption occurs in the incident radiation prior to emission. There is a further complication in the latter case: the Doppler shift of the absorption is determined by the wind component in the direction of the sun, while the Doppler shift of the emission is determined by the wind component in the direction of viewing. The effects of these absorption processes on wind and temperature estimates is discussed. (Auth.)

K-49889

De Deuge, M.A., Greet, P.A., Jacka, F., Optical observations of gravity waves in the auroral zones, *Journal of atmospheric and terrestrial physics*, Apr. 1994, 56(5), p.617-629, Refs. p.628-629.

Night-time observations of O(¹D) 630 nm and O(¹S) 558 nm thermospheric emissions were made at Mawson Station from 1982 to 1989, using a three-field photometer. Cross-spectral analysis of the data was used to extract frequencies and horizontal trace velocities of periodic structures. Structures in the 630 nm emission were characteristic of large-scale waves, and those in the 558 nm emission were characteristic of medium-

scale waves. The results showed distinct polarization of the propagation azimuths; waves in the 630 nm emission propagated approximately north-westward throughout the 8 yr period, whilst propagation azimuths of waves in the 558 nm emission appeared to be solar-cycle-dependent. It is suggested that waves observed in the 630 nm emission were of predominantly auroral electrojet origin, whilst those observed in the 558 nm emission were of both auroral and tropospheric origin. (Auth.)

K-49890

Beggs, H.M., Essex, E.A., Rasch, D., **Antarctic polar cap total electron content observations from Casey Station**, *Journal of atmospheric and terrestrial physics*, Apr. 1994, 56(5), p.659-666, 16 refs.

In early 1990 a modified JMR-1 satellite receiver system was installed at Casey Station, in order to monitor the differential phase between the 150 and 400 MHz signals from polar orbiting NNSS satellites. Total electron content (TEC) was calculated using the differential phase and Casey ionosonde *foF2* data, and is presented here for near sunspot maximum in Aug. 1990 and exactly one year later. The data are used to investigate long-lived ionization enhancements at invariant latitudes polewards of -80 deg lambda, and the 'polar hole', a region from -70 to -80 deg lambda on the night side of the polar cap where reduced electron density exists because of the long transport time of plasma from the dayside across the polar cap. A comparison is made between the Casey TEC data and the Utah State University Time Dependent Ionospheric Model (TDIM) which uses as variables the solar index (F10.7), season (summer, winter or equinox), global magnetic index (Kp), IMF By direction, and universal time (UT). (Auth.)

K-49891

Dunlop, I.S., et al, **Multistation study of long period geomagnetic pulsations at cusp and boundary layer latitudes**, *Journal of atmospheric and terrestrial physics*, Apr. 1994, 56(5), p.667-679, Refs. p.678-679.

The characteristics of 1-20 mHz (Pc5) geomagnetic pulsations, recorded during the daytime on the ground at cusp and boundary layer latitudes at 5 Australian antarctic stations, have been examined. On quiet and moderately disturbed days the major spectral contributions are due to 3 different mechanisms. Sustained oscillations whose properties are consistent with the Kelvin-Helmholtz instability at the low latitude boundary layer are the dominant mechanism at -70 to -75 deg geomagnetic latitude. Transient irregular pulsations are frequently seen at single stations at the foot of polar cap and boundary layer field lines. Occasionally similar transients occur essentially simultaneously at widely spaced stations, accompanied by absorption spikes on riometer records. The latter signals are most likely due to solar wind pressure pulses on the magnetopause. At cusp latitudes the major spectral contribution arises from sustained irregular pulsations centered on magnetic noon. Although their occurrence is related to the proximity of the cusp's particle signature, it may be more appropriate to discuss these signals in terms of fluctuations in boundary layer or mantle currents. (Auth.)

K-49917

Morishima, K., Ono, T., Hayashi, K., **Evaluation of energy parameters of auroral electrons by using photometric observations and its application to investigate a generation mechanism**, *Antarctic record*, Nov. 1993, 37(3), p.205-230, In Japanese with English summary. 20 refs.

The relations between average energy and total energy flux of incident electrons are examined for three types of auroras: type A aurora, pulsating aurora, and discrete aurora in auroral breakup. The energy parameters of primary electrons are derived by using measured intensities at 844.6 nm (OI) and 670.5 nm (N₂1PG) from multi-channel photometer observation at Showa Station in 1990. It is shown that each auroral type has its own relationship with energy parameters of precipitating electrons. In a discrete aurora, downward electron energy flux generally varied proportionally with the square of average energy. This tendency can be identified as an ohmic-like feature; the special relation is accounted for by a theory in which electrons are accelerated by a field-aligned potential difference. In some discrete auroras, precipitating electrons did not show ohmic-like behavior. These exceptional cases are thought to be caused by two factors: a geometric relation between auroral arcs and the field of view of the pho-

tometer, and the change of the L-E-L constant in the magnetosphere due to temporal variations of plasma parameters, such as electron density and thermal energy in the source region of the auroral particles. (Auth.)

K-49918

Yabu, T., et al, **Upgraded method for reconstructing 3-dimensional structure of aurora from stereo images**, *Antarctic record*, Nov. 1993, 37(3), p.231-251, In Japanese with English summary. 7 refs.

In a reconstruction study of auroral 3-D luminous structure from stereo images, the authors used the model function method in which the auroral structure is expressed by an appropriate function with some parameters determined by iterative calculations. The auroral model assumes a sheet-like luminosity structure with some prescribed thickness and altitude distributions. In this paper, an upgraded model function is presented which can express an aurora of more complex structure. The upgraded model is expressed by the product of a 2-D function which represents projections of an aurora along the geomagnetic lines of force onto the horizontal plane and an altitude function along the geomagnetic line of force. With this model, curved aurora arcs and pulsating auroras of irregular form can be more properly delineated. An aurora arc observed in Iceland and a pulsating aurora observed in Antarctica are analyzed. The appropriateness of the functional form which expresses the altitude profile of the luminosity of aurora based on theoretical prediction is also examined. (Auth. mod.)

K-49925

Kato, K., et al, **Report of the 1992 geomagnetic conjugate campaign and the present observation system in Iceland**, *Antarctic record*, Nov. 1993, 37(3), p.348-363, In Japanese with English summary. 9 refs.

This paper describes the observation system and maintenance work performed in Iceland, conjugate with Showa Station, during the conjugate aurora observation period from Sep. 1 to Oct. 5, 1992. The program consisted of the following: observation of visible auroras with an all-sky SIT TV camera; aurora emission (670.5 nm and 844.6 nm) intensity measurements with a multichannel scanning photometer; and ionosphere electron density measurement with a TECmeter using radio waves transmitted from GPS and NNSS satellites. Maintenance work carried out on the continuous observation system was to rebuild a VLF antenna, to change induction magnetometer sensors and to remove a fluxgate magnetometer sensor. It is noted that continuous observation systems present several problems, including superannuation and difficulty in obtaining spare parts. (Auth. mod.)

K-49936

Smith, A.J., comp, Phillips, C.M., comp, Crane, S.B., comp, Rodger, A.S., comp, **Solar terrestrial physics from Antarctica 1980-1991: a bibliography**, Cambridge, UK, British Antarctic Survey, 1993, 70p., 930 refs.

A bibliography is given of publications during the twelve years 1980-91 in the field of solar terrestrial physics and geospace research, which either use data from Antarctica or are in some other way specifically relevant to Antarctica. The list of 930 items is cross-referenced by subject area, technique and antarctic location.

K-49946

Bensadoun, M., et al, **Liquid-helium-cooled absolute reference cold load for long-wavelength radiometric calibration**, *Review of scientific instruments*, Oct. 1992, 63(10, Pt.1), p.4377-4389, 38 refs.

Described here is a large (78 cm) diameter liquid-helium-cooled blackbody absolute reference cold load for the calibration of microwave radiometers. The load provides an absolute calibration near the liquid-helium (LHe) boiling point, with total uncertainty in the radiometric temperature of less than 30 mK over the 2.5-23 cm wavelength (12-1.3 GHz) operating range. This cold load has been used at several wavelengths at the South Pole and at the White Mountain Research Station, CA to calibrate spectral measurements of the cosmic microwave background radiation. For the instruments operated at 20-, 12-, 7.9-, and 4.0-cm wavelength at South Pole, the total corrections to the LHe boiling-point temperature (about 3.8 K) were 48, 18, 10, and 15 mK, respectively. In operation, the

average LHe loss rate was below 4.4 l/h, allowing day-long periods of operation without LHe fill. The boiloff rate is not strongly dependent on the radiative load at the aperture, yielding very stable operation and radiometric performance. Design considerations, radiometric and thermal performance, and operational aspects are discussed. A comparison with other LHe-cooled reference loads, including the predecessor of this one, is given. (Auth. mod.)

K-50003

Dudeney, J.R., Baker, K.B., Stoker, P.H., Walker, A.D.M., **Southern Hemisphere Auroral Radar Experiment (SHARE)**, *Antarctic science*, Mar. 1994, 6(1), p.123-124, 10 refs.

The Southern Hemisphere Auroral Radar Experiment (SHARE) aims to establish a dual HF backscatter radar system in Antarctica by deploying a new radar at SANAE Station to operate in tandem with the pre-existing radar at Halley Station in studies of the dynamics of geospace. The SANAE radar is planned to be installed and commence operation in early 1995.

K-50109

Zverev, V.L., et al, **Simultaneous observations of north and south polar cap aurorae**, *Geomagnetism and aeronomy*, 1992 (Publ. Apr. 1993), 32(5), p.640-642, 25 refs.

The locations of the discrete forms of polar cap aurorae of the northern and southern hemispheres are compared for four time intervals. It is shown that discrete forms of the aurorae in the different hemispheres can appear in one time sector, can be arranged symmetrically with respect to the noon-midnight line, or they may appear in only one hemisphere. In all of the cases considered the discrete forms appeared in intervals with $B_z < 0$. Movements of the aurorae were observed along the morning-evening meridian both toward the center of the polar cap and toward its edges, with these movements not being uniquely related to the magnitude and direction of the B_z component of the IMF. The appearance of discrete forms for $B_z < 0$ and their presence in only one hemisphere may attest to the open character of the magnetosphere in these cases. (Auth.)

K-50142

Stoker, P.H., **Energetic electron power flux deposition at SANAE (L=4.0) from riometer recordings**, *Journal of geophysical research*, Nov. 1, 1993, 98(A11), p.19,111-19,116, 21 refs.

The annual temporal pattern of energetic (>40 keV) electron energy flux deposited per second into the atmosphere has been estimated at SANAE. It is concluded that the energy flux is closely related to geomagnetic activity, both for auroral precipitation during magnetic active periods and for particles precipitated from the trapping regions. The average energy flux deposited per second is strongly peaked during the equinoxes and has a deep minimum during the summer and winter, related to the equinoctial effect of geomagnetic activity. No difference exists between the energy fluxes during the illuminated antarctic summer and the dark antarctic winter. It follows then that the daytime deposited flux is larger than the nighttime averaged deposition of energetic electrons. The averaged electron energy flux peaked during 1973-1975 and 1982-1984, years with persistent solar wind high-speed streams from low solar latitude coronal holes, and has a lower value in years of solar polar magnetic reversal, i.e., in 1971 and in 1980, than during solar minimum activity in 1976 and 1986/87. In the 20 years of investigation, the solar flare events of Aug. 1972 and Oct. 1989 are outstanding in flux of electron precipitation, being some 3 orders of magnitude larger than the annually averaged flux. (Auth. mod.)

K-50178

Bol'shakova, O.V., Borovkova, O.K., **Particle penetration zones in a quiet magnetosphere with geomagnetic pulsations** [Opredelenie zon vtorzheniia chastits v spokoinoi magnitosfere po nabludeniiam geomagnitnykh pul'satsii], *Antarktika*, 1993, No.31, p.5-7, In Russian with English summary. 6 refs.

The possibility of identification of various regions of penetration of particles in daytime at high latitudes has been investigated. It has been established that under quiet conditions the probability of observations of geomagnetic pulsations P1C and P1-2 is minimum at noon, with a time

span of about 2 hours, which allows one to identify this gap as the region of penetration of particles or the cusp proper against the background of more energetic particles of the cleft. (Auth.)

K-50179

Dovbnia, B.V., Matveeva, E.T., Shchepetnov, R.V., **Solar wind and high latitude geomagnetic pulsations in the 0.5-4.0 Hz range** [Diagnostika solnechnogo vetra po nabludeniiam vysokoshirotnykh geomagnitnykh pul'satsii v diapazone 0.5-4.0 Gts], *Antarktika*, 1993, No.31, p.8-14, In Russian with English summary. 4 refs.

A new type of geomagnetic pulsation in the range of 0.5-4.0 Hz has been determined. The pulsations have a threshold nature of generation and are observed in the region of dayside polar cusp when the density of solar wind is not less than $10/\text{cm}^3$. The frequency of pulsations increases with the enhancement of density and velocity of the solar wind. The possibility of using pulsations for interplanetary space investigations is also studied. (Auth.)

K-50180

Popov, V.A., et al, **Comparison of AE electrojet indices between hemispheres** [Sravnenie AE-indeksov elektrostrui po dannym Severnogo i IUzhnogo polushariu], *Antarktika*, 1993, No.31, p.15-20, In Russian with English summary. 6 refs.

From data obtained at 21 antarctic stations, auroral electrojet (AE) indices were calculated for the periods of June 10-13 and June 27-29, 1982. These were compared with the standard AE index calculated from data obtained at 12 stations in the Northern Hemisphere, showing similar values, although their amplitude is lower in the Southern Hemisphere than could be attributed to seasonal variations. The similarity of index values is closest when the Southern Hemisphere stations are in the electrojet maximum intensity zone. It is concluded that the standard AE index can be used as a basis for analysis of events in the Southern Hemisphere.

K-50276

Paquette, J.A., et al, **Source regions of long-period pulsation events in electron precipitation and magnetic fields at South Pole Station**, *Journal of geophysical research*, Mar. 1, 1994, 99(A3), p.3869-3877, 24 refs.

Pulsation events having long (100-1000 s) periods with a consistent frequency in both particle precipitation and surface geomagnetic field variations have been reported in the past from measurements made at various geomagnetic latitudes. An examination of broad beam riometer and magnetometer data from South Pole Station for the interval from 1982 to 1989 revealed nearly 200 such events. The onset times of these events were determined, and the results compared with predictions based on the work of Coroniti and Kennel (1970). The onset of pulsations in the magnetometer data lags the onset of pulsations in the riometer data by several minutes. This disparity in onset times, together with modulation of VLF emissions in the 0.5-1 kHz band, serves as an important indicator of whether or not an event can be explained by the above-cited theory. While about a third of the events fit the prediction of Coroniti and Kennel, another third do not. In these events, the onset of magnetic and precipitation pulsations is nearly simultaneous, and possible alternative generation mechanisms are explored. In the remaining third of the events, magnetic pulsations begin substantially earlier than precipitation pulsations. Data from the imaging riometer at South Pole Station indicate that this third class of events can be accounted for by considering the effects of transverse motion of a persistent precipitation region. (Auth. mod.)

K-50277

Liao, B., et al, **Balloon observations of nightside Pc 5 quasi-electrostatic waves above the South Pole**, *Journal of geophysical research*, Mar. 1, 1994, 99(A3), p.3879-3891, 61 refs.

Reported here is a unique Pc 5 band quasi-electrostatic wave event (300 s period) observed near local geomagnetic midnight at an invariant latitude of 75 deg. The electric field signal was obtained from one of eight high-latitude balloon payloads. The balloon payloads were instrumented with double-probe electric field detectors and bremsstrahlung X ray detectors. The electric field data from one flight of particular interest have been compared with ground-based magnetometer and micropulsation data in an attempt to understand the nature of the wave event. The Pc 5 waves were

linearly polarized in the electric field, the electric field components had amplitudes of 20 to 30 mV/m, and the event persisted for an interval of more than 3 hours from 0000 to 0330 UT (2030 to 2400 MLT) on Dec. 22, 1985. The magnetic activity was quiet during this time period. Detailed power spectra are presented in the paper. No evidence was found suggesting that the event was produced by an artifact. The event was not associated with atmospheric neutral waves, weather processes, or upward propagating gravity waves; it was produced in the ionosphere by a process other than the convection of irregularities. The authors suggest that ULF magnetosonic waves originating at the magnetopause produced the signals that were observed. (Auth. mod.)

K-50283

Hargreaves, J.K., Rosenberg, T.J., Detrick, D.L., **Dynamics of auroral precipitation in the morning sector observed with the imaging riometer at South Pole station: evidence of co-rotating precipitation regions**, *Journal of atmospheric and terrestrial physics*, May 1994, 56(6), p.783-793, 23 refs.

The movement of auroral radio absorption events over distances up to 300 km has been studied for several intense substorms using the imaging riometer at South Pole Station. In the morning sector, two kinds of motion have been identified. Individual events move through the field-of-view at speeds generally in the range 400-900 m/s, and there is a tendency for successive absorption peaks to maximize at an almost constant longitude for several hours. The gradient-curvature drift of electrons with energies of order 25 keV may contribute to the rapid motions observed, though their tendency not to follow the path of constant invariant latitude suggests that other factors may be involved. Several mechanisms that might account for co-rotating precipitation regions have been examined, but none has been found to be entirely satisfactory. The most plausible hypothesis is that they are a consequence of irregularities in the cold plasma in the magnetosphere. (Auth.)

K-50373

Katan, J.R., **High frequency (HF) and meteor burst communications in a polar environment**, *U.S. Naval Undersea Warfare Center Detachment. Final report*, Sep. 30, 1993, NUWC-NPT-TD-10375, var. p., ADA-271 604.

HF radio provides a low-cost, long-range communications alternative to satellite communication (SATCOM). In the polar environment, however, the frequent occurrence of dense sporadic E layers during summer in high-sunspot periods can prevent propagation in the HF band for the desired communications ranges. During solar storms, intense radiation may induce significant D-region absorption which further reduces the utility of HF radio. These phenomena cannot be defeated by the use of automatic link establishment (ALE) HF radio equipment because of the broadband nature of these effects. The use of VHF communication techniques, such as meteor scatter, provide a viable supplement to maintain connectivity when normal ALE HF radio is ineffective. This study combines the analysis of Scott Base ionosonde data with computer predictions using A Stand-Alone Prediction Program (ASAPS) from the Australian Radio Prediction Service and IONCAP from the Institute for Telecommunications of the U.S. Department of Commerce to quantify the possibility of HF communications and suggest suitable radio system design parameters. Similarly, predictions of meteor burst (MF) link performance are provided for comparison with available measurements so that comparisons may be performed with actual link operations.

K-50415

Dreschhoff, G.A.M., Zeller, E.J., Qin, D., Parker, B.C., **Major solar flares and long-term variability in antarctic ice cores**, *Advances in space research*, Sep. 1993, 13(9), p.(9)443-(9)446, 20 refs.

In-situ data acquisition of high-resolution nitrate concentration in antarctic snow resulting from ionization in the polar atmosphere reveals (a) very large solar proton events can be resolved, (b) a signal from thermospheric and mesospheric sources is found across Antarctica within the average boundaries of the auroral oval, (c) long-term periods of high or low solar activity such as the Maunder Minimum are present in the nitrate record. (Auth.)

K-50470

Kamata, M., Igarashi, K., **Records of radio aurora at Syowa Station, Antarctica in 1992**, *Japanese Antarctic Research Expedition. JARE data reports*, Mar. 1994, No.195, 151p., 1 ref.

A summary of data obtained with the auroral radar at Showa Station during 1992 is presented. The available data include chart records of the time variation of echo intensity, digital MT, and 35 mm film records of radio auroral echo intensity (A-scope) and range-time intensity (A'-scope). A brief explanation of diagrams and a bibliography relevant to records of radio aurora at Showa Station between 1966 and 1991 are also presented.

K-50471

Kamata, M., Kunitake, M., **Radio observation data at Syowa Station, Antarctica during 1992**, *Japanese Antarctic Research Expedition. JARE data reports*, Mar. 1994, No.196, 202p.

Absorption of cosmic radio noise has been observed at Showa Station with a standard riometer at 30 MHz since Feb. 1966. This report presents data observed during 12 days of Jan. 1991, and from Jan. 1 to Dec. 31, 1992, in the format of hourly values and combined data plots. Other observational data are presented for reference. These data include geomagnetic field, HF, VLF and radar observations. A bibliography relevant to riometer records of 30 MHz cosmic noise at Showa Station between 1967 and 1991 is included.

K-50472

Ichinose, M., Kamata, M., **HF field strength data measured at Syowa Station, Antarctica from January to December, 1992**, *Japanese Antarctic Research Expedition. JARE data reports*, Mar. 1994, No.197, 17p., 1 ref.

The report summarizes the results of field strength measurements of JJY 8 MHz at Showa Station for Jan.-Dec. 1992. Additional information, with tabulated data, is provided on observers, particulars of the transmitter and receiver, derivation of the skywave field strength, monthly tabulation sheets, and diurnal variations of the field strength.

K-50507

Morrison, K., et al, **Study of quasi-periodic ELF-VLF emissions at three antarctic stations: evidence for off-equatorial generation?**, *Annales geophysicae*, Apr. 1994, 12(2/3), p.139-146, Refs. p.145-146.

The spatial extent and temporal behavior of quasi-periodic (QP) intensity modulations of 0.5-2 kHz ELF-VLF signals were investigated in a comparative study of data collected at the antarctic stations of Amundsen-Scott (L=14), Halley (L=4), and Siple (L=4). Frequently, the waveforms of ELF-VLF signals simultaneously received at each site were identical. Although of similar frequency structure, the waveforms of the accompanying Pc3 magnetic pulsations did not show a one-to-one association. Whereas both are dayside phenomena, QP emissions occur over a smaller range of local times, and have a maximum of occurrence later in the day closer to local noon. QP emissions are identified with the periodic modulation of the electron pitch-angle distribution by the propagation of ULF compressional fast-mode waves through a region. However, contrary to previous ideas, rising-tone emissions do not represent the frequency-time signatures of such waves. In addition to generation close to the equatorial plane, the authors propose an additional high-latitude source of QP emissions. These emissions are associated with regions of minimum B produced by the dayside compression of the magnetosphere close to the magnetopause. Model magnetic field calculations of these minimum-B regions as a function of magnetic local time and invariant latitude are presented. (Auth.)

K-50586

Lanzerotti, L.J., MacLennan, C.G., Medford, L.V., **Inferred quasi-steady ionospheric neutral winds and electrical currents at 79 deg south latitude in austral summer conditions**, *Geophysical research letters*, Feb. 1, 1994, 21(3), p.217-220, 25 refs.

An analysis of the range of geomagnetic variations as measured at Arrival Heights and Amundsen-Scott Station over an 8-year interval during the present solar cycle shows that there are quasi-DC level shifts in

some of the magnetic components during austral summer conditions when referenced to austral winter. The most dramatic of these level shifts in the signals occurs in the D-component (west-east magnetic component) at Arrival Heights (geomagnetic latitude 79S). The onsets of the D-component shifts occur during a period that lasts one to several days in late austral spring. Such geomagnetic variations would not appear to arise from magnetosphere processes coupling to the ionospheric E-region. The inferred quasi-steady ionospheric current is estimated to be of the order of 10^5 amps above Arrival Heights. It is speculated that neutral wind dynamics with quasi-steady E-region (110-115 km) neutral wind speeds of 10 m/sec directed east to west above AH are responsible for generating the austral summer electrical currents in the E-region. (Auth.)

K-50678

Yamagishi, H., ed, NIPR Symposium on Upper Atmosphere Physics, 16th, Tokyo, Dec. 15-16, 1992, **Proceedings of the NIPR Symposium on Upper Atmosphere Physics, No.7**, Tokyo, National Institute of Polar Research, 1994, 76p., Refs. passim. For selected papers see K-50679 through K-50681.

This volume contains 8 selected scientific papers among 70 individual contributions presented at the 16th Symposium on Coordinated Observations of the Ionosphere and the Magnetosphere in the Polar Regions, held at the National Institute of Polar Research on Dec. 15-16, 1992. Three full length papers are pertinent to Antarctica and deal with ion temperature in the polar cap, HF Doppler observations, and meteorological correlations with solar-terrestrial phenomena.

K-50679

Sagawa, E., Watanabe, S., **Ion temperature in the polar cap observed by Supra-thermal ion Mass Spectrometer on Akebono satellite**, NIPR Symposium on Upper Atmosphere Physics, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.1-12, 13 refs.

Mass resolved ion temperatures in the polar cap at altitudes between 2,000 and 10,000 km are studied statistically based on observations made by the Suprathermal Mass Spectrometer (SMS) on the Akebono satellite. Ion temperature is obtained by calculating the zeroth, first, and second order moments of two-dimensional ion distribution functions. The method provides not only ion temperature but also parallel and perpendicular temperatures with respect to the magnetic field, by assuming a bi-Maxwellian distribution. The moment calculation also provides other plasma quantities such as density and drift velocities. Ion distribution functions and a summary plot of plasma parameters observed by SMS over Showa Station on Sep. 21, 1992, and Sep. 21, 1990, respectively, are shown. (Auth. mod.)

K-50680

Nozaki, K., Kikuchi, T., Troshichev, O.A., **HF Doppler observation between Vostok and Syowa, Antarctica**, NIPR Symposium on Upper Atmosphere Physics, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.53-59, 6 refs.

Continuous short waves transmitted from Vostok Station were received at Showa Station on monthly Regular World Days (RWDs). The transmitted frequencies were 14.985 MHz from 0700 to 0900 UT and 9.18 MHz from 1600 to 1800 UT. The cusp approached the midpoint of the circuit at the end of the UT morning transmission. Two kinds of Doppler structures were clearly recognized. Narrow band Doppler lines were consistently found during both morning and evening transmissions, whereas wide band Doppler structures dominated only in the morning. The wide band structures appeared and disappeared abruptly and sometimes had two spectral peaks corresponding to velocities of separated irregularities around the midpoint. The narrow-band structures still remained while the wide-band structures changed spectrum shapes. Sawtooth-like Doppler structures were found in the narrow-band lines in the morning transmissions. (Auth.)

K-50681

Watanabe, T., Fujita, E., **Meteorological correlations with solar-terrestrial phenomena: a provisional study**, NIPR Symposium on Upper Atmosphere Physics, Proceedings. No.7, Tokyo, National Institute of Polar Research, 1994, p.60-72, 7 refs.

A provisional data analysis to find the effect of solar-terrestrial events on the tropospheric and lower stratospheric atmosphere was made using radiosonde observations over Japan in 1988-1992. A provisional analysis of radiosonde data at Showa Station in 1990 is also given. Since the analyzed interval is short, only very provisional results are shown. In antarctic winter season (Apr.-Sep.), solar proton events produced no appreciable effect in the tropospheric/stratospheric temperatures. Tropospheric cooling and stratospheric heating are seen in the cases of geomagnetic storms (14 events). It is necessary to perform further data analysis using a comprehensive database covering many years. (Auth. mod.)

K-50696

Fujii, R., et al, **Upper atmosphere physics (UAP) data obtained at Syowa and Asuka Stations in 1991, Japanese Antarctic Research Expedition. JARE data reports**, Mar. 1994, No.193, 208p., 12 refs.

This report summarizes upper atmosphere physics data acquired by the *Upper Atmosphere Physics Monitoring System* at Showa and Asuka stations in 1991. The items of observations at both stations are as follows: geomagnetism; ELF-VLF waves; ionosphere (cosmic noise absorption at 30 MHz); and aurora (meridian scanning record at 3 wavelengths). The systems were installed at Showa Station in Jan. 1981, and at Asuka in Jan. 1987. An outline of the systems, specifications of the observation instruments, the recording periods, and the format of the compiled digital data are included. Magnetograms for Jan. 1-Dec. 31, 1991 at Showa and for Jan. 1-Nov. 15, 1991 at Asuka Station are given in an appendix.

K-50736

Menk, F.W., et al, **Multistation observations of Pc1-2 ULF pulsations in the vicinity of the polar cusp**, *Journal of geomagnetism and geoelectricity*, 1993, 45(10), p.1159-1173, Refs. p.1171-1173.

Geomagnetic pulsations with frequencies in the range 0.1-2.5 Hz have been recorded with a six station antarctic magnetometer array ranging in latitude from -62.3 to -80.6 deg invariant. The observed spectral characteristics were compared with the cusp and boundary layer locations for selected days in Nov. and Dec., 1986 and July, 1990, in order to determine wave source regions. Specific pulsation features have been identified with different magnetospheric regions. Narrowband unstructured Pc2 emissions typically around 0.2 Hz and short discrete Pc1 packets or bursts with frequencies below 0.4 Hz occur in the local morning at boundary layer latitudes, accompanied by generally enhanced power levels between about 0.1 and 0.5 Hz. These emissions are probably due to ion-cyclotron waves generated near or below the He^+ gyrofrequency on boundary layer field lines. Propagation of such signals into the polar cap via the ionospheric waveguide is uncommon, perhaps due to the existence of severe ionospheric irregularity features near the dayside auroral oval. Structured and quasistruktured emissions such as hydromagnetic chorus are recorded at the foot of plasmatrough field lines and are consistent with ion-cyclotron wave generation and propagation on closed field lines in the outer magnetosphere. (Auth. mod.)

K-50737

Papitashvili, V.O., **Electric potential patterns in the northern and southern polar regions parameterized by the interplanetary magnetic field**, *Journal of geophysical research*, July 1, 1994, 99(A7), p.13,251-13,262, Refs. p.13,260-13,262.

Electric potential patterns have been obtained from the IZMIRAN electrodynamic model (IZMEM) for the northern and southern polar regions during summer, winter, and equinox. The model is derived from a large quantity of high-latitude ground-based geomagnetic data (above ± 57 deg corrected geomagnetic latitude) at all magnetic local time hours. A linear regression analysis technique has been used to obtain the quantitative response of each magnetic observatory to changes of interplanetary magnetic field (IMF) components. Since no ionospheric conductivity model exists specifically for the south polar region, the statistical model of Wallis and Budzinski (1981) has been applied in both hemispheres. Asymmetry in the potential pattern geometry in both hemispheres can be attributed either to the influence of the "northern" ionospheric conductivity model which was applied to the south polar region, or to some natural phenomena. It is concluded that IZMEN provides realistic convection pat-

terns parameterized by the IMF component directions and magnitudes, and may be used to provide routine estimates of convection patterns and electric potentials if IMF data are available. (Auth. mod.)

K-50747

Bally, J., **Infrared and sub-millimeter searches for extra-solar planetary systems from Antarctica**, *Astrophysics and space science*, Feb. 1994, 212(1-2), p.395-406, 11 refs.

Large single-dish telescopes and long baseline interferometers operating at mid-infrared to sub-millimeter wavelengths may provide the best opportunity to search for planets and protoplanets during the next several decades. The interior of Antarctica may be the best place to deploy such instrumentation, providing a viable compromise between the costs associated with space-based deployment and site quality. (Auth.)

K-50817

Kosch, M.J., Scourfield, M.W.J., **Resolution of temporal and spatial ambiguities of intensity variations within pulsating aurorae**, *Journal of geophysical research*, Oct. 1, 1992, 97(A10), p.14,877-14,883, 8 refs.

Systems for imaging optical emissions all have a detection sensitivity which, be it uniform or not, can make image interpretation very difficult. A time differential technique involving pixel-by-pixel subtraction of successive images has been developed to overcome this problem. The technique has been applied to images of pulsating aurorae recorded with a low-light-level television system at SANAE Station. Individual auroral forms exhibit within a short interval of time a diversity of pulsation modes not evident by direct visual inspection of the television images. The results are important for possible source mechanisms or any meaningful classification scheme for pulsating aurorae. (Auth.)

K-50908

Lanzerotti, L.J., et al, **Cusp latitude magnetic impulse events. 1. Occurrence statistics**, *Journal of geophysical research*, Aug. 1, 1991, 96(A8), p.14,009-14,022, 68 refs.

Magnetic impulse events were selected by a computer algorithm procedure from magnetic records obtained at the near cusp latitude conjugate stations Iqaluit, Northwest Territories, Canada, and South Pole Station. The algorithm was constructed to select large (50 nT in the vertical component of the magnetic field), short lived (6 to 12 min) events. These events were highly localized in the 06 to 18 LT sector at the two stations. A strong minimum in occurrence was found during hour 11 LT. The field changes associated with these events can be interpreted as due to an approximately half-cycle, odd-mode Alfvén wave along a near-magnetopause flux tube. From the vertical magnetic deflections of the impulse events the directions of field-aligned currents into the conjugate ionospheres were inferred. In the morning LT sector, field-aligned currents were directed into the ionospheres, while in the afternoon LT sector, field-aligned currents were directed out of the ionospheres. These findings are comparable with the statistical results for quasi-stationary field-aligned currents and suggest that at the times of these events, Iqaluit and South Pole are at a higher effective magnetic latitude. The average deflection in the vertical component for the events was measured at 95 nT. From this, the formulation for the magnitude of the average field-aligned currents becomes: field aligned current approximately equals $2 \times 10^{-7} \text{ A/m}^2$. (Auth. mod.)

K-50909

Rodger, A.S., Dudeney, J.R., **Is the poleward edge of the trough a sensitive indicator of geospace interactions**, *Advances in space research*, 1987, 7(8), Magnetosphere, ionosphere and thermosphere. Proceedings of the Topical Meeting of the COSPAR Interdisciplinary Scientific Commission C (Meeting C1) of the COSPAR Twenty-Sixth Plenary Meeting held in Toulouse, France, 30th June-11th July 1986. Edited by E.R. Schmerling, p.(8)65-(8)74, 26 refs.

The poleward edge of the main ionospheric trough can often be regarded as the ionospheric signature of the equatorward boundary of the plasma sheet. Advanced Ionospheric Sounder observations of the poleward edge from Halley, Antarctica are used to investigate some aspects of its dynamics with respect to changes of magnetospheric and solar wind conditions. There is frequent rapid equatorward motion of the poleward edge from about 20 min before to about 30 min after the onset of the main

phase of a substorm. These observations are discussed in terms of the dynamics of the plasma sheet during substorm activity. Another class of rapid equatorward motion of the poleward edge of the trough has no apparent cause in the magnetosphere or solar wind. Possible explanations involving longitudinal structure of the trough or small-scale structure of the solar wind are considered. (Auth.)

K-50957

Zong, Q.G., Ye, Z.H., Xue, B.S., Ye, X.W., **Influence of the cosmic ray Forbush decrease on the low ionosphere in the polar region**, *Antarctic research*, June 1993, 4(1), p.1-11, For Chinese version see K-49599. 14 refs.

Based on the ionization theory of cosmic ray polar ionosphere, the relationship between Forbush decrease and cosmic noise absorption during the polar night is analyzed. From riometric data recorded at Zhongshan Station, it is concluded that the influence of cosmic ray Forbush decrease on cosmic noise absorption is well interpreted by the above theory. (Auth. mod.)

K-50968

Van Stekelenborg, J., **Search for point sources of ultrahigh energy gamma rays with the South Pole Air Shower array**, Newark, University of Delaware, 1993, 351p., University Microfilms order No. 93-34013, Ph.D. thesis. Refs. p.330-351.

This dissertation describes the search for ultrahigh energy gamma rays from discrete sources with the South Pole Air Shower Experiment (SPASE). The design, configuration, and performance of the telescope are discussed, followed by a description of the techniques used for data analysis. Two novel analysis methods were developed and subsequently applied to the SPASE database: a neural network was applied to the problem of air shower core location, and a CUSUM method was used to identify gamma-ray bursts. Three years worth of data (1988, 1989 and 1991) were searched for emission of ultrahigh energy gamma radiation from nine pre-defined point sources. No conclusive evidence was found for DC emission from any of the nine candidates. In light of this, upper limits have been set on the time averaged flux detectable by the SPASE array. A search for sporadic emission from the nine sources was conducted at time scales of one hour, one day, and one week. A statistically significant excess from SMC X-1 (99.6% c.l.) was detected during one day in 1991: 178 events on-source versus 120 background events. (Auth. mod.)

K-50998

Konik, R.M., et al, **Cusp latitude magnetic impulse events. 2. Interplanetary magnetic field and solar wind conditions**, *Journal of geophysical research*, Aug. 1, 1994, 99(A8), p.14,831-14,853, 68 refs.

The interplanetary magnetic field (IMF) conditions and solar wind plasma parameters at the near cusp latitude stations Iqaluit, NWT, Canada, and South Pole Station are examined. The impulse events occur during periods of high IMF variability. The prevailing IMF orientation averaged over 11-min periods during the events shows no distinct anisotropies. However, by examining the IMF orientation when the IMF variability is small, a southeast anisotropy is noted. Examining the IMF orientation on time scales of less than 1 min reveals that the impulse events are characterized by a more southward oriented IMF than is to be expected statistically. The duration of the events is controlled by both solar wind speed and by the IMF By. The IMF By control of the duration of nonconjugate events is in accordance with the effect expected from the presence of magnetic tension in a reconnection setting. The amplitude of the events is strongly related to solar wind speed. These conditions suggest that sporadic reconnection is among the mechanisms producing the events. It is concluded that a change in the solar wind dynamic pressure, while not among the primary mechanisms generating the magnetic impulse events, may account for between 15% and 30% of them. It is also argued that magnetic reconnection is likely responsible for generating a minimum of 50-70% to a maximum of 90% of the events. However, this conclusion leaves parts of the picture unclear. It is suggested that the Kelvin-Helmholtz instability may mediate the process by which sporadic reconnection produces a ground signature. (Auth. mod.)

K-51009

Xu, W.Y., **Comparative study on the ionospheric current sys-**

tems in the Antarctic and Arctic regions, *Antarctic research (Chinese edition)*, Mar. 1994, 6(1), p.8-16, In Chinese with English summary. 11 refs.

The current systems representing the solar and lunar daily variations (S and L) of the geomagnetic field have been calculated on the basis of data obtained from the global network of geomagnetic observatories. The characteristics of these current systems in the antarctic and arctic regions have been analyzed comparatively. The results show the following: there are certain differences in the current systems of these two regions, which implies definite differences in the ionosphere dynamic processes responsible for both S and L and the field-aligned current responsible for S; there are notable differences in the internal current systems of these two polar regions, which is attributed to both the inducing field (current) and underground conductivity. In general, the conductivity of the antarctic region is higher than that of the arctic region. (Auth.)

K-51010

Liu, R.Y., Liu S.L., Wen, B., Liu, C.F., **Ionospheric effects of the March 13, 1989 magnetic storm at subauroral region, *Antarctic research (Chinese edition)***, Mar. 1994, 6(1), p.17-24, In Chinese with English summary. 10 refs.

Ionograms and magnetograms obtained at Great Wall Station were used to study the subauroral ionospheric effects of the Mar. 13, 1989 magnetic storm. The virtual height of the F region ($h'F$) increased and the critical frequency (F_oF_2) decreased rapidly just after the storm's sudden onset (SSC). Then the spread F appeared and lasted about 5 hours. During the main phase of the magnetic storm, the ionosphere showed severe absorptions, but large enhancements in $h'F$ and associated depressions in f_oF_2 were still observed. On the second and third nights after the SSC, auroral type sporadic E and night E layers were observed, showing peak electron densities as high as $7.5 \times 10^5 \text{ el/cm}^3$. The causes of these phenomena are discussed. Behaviors of $h'F$ and f_oF_2 from 4 ionosonde stations in the same longitude sector (Great Wall, Port Stanley, Cachoeira Paulista and Fortaleza) show that the higher the station's latitude, the more severe the absorptions and the longer the depressions of f_oF_2 . (Auth. mod.)

K-51015

Sun, X.R., Wang, J.J., Du, J.H., Yang, W.F., **Delay measurements and the propagation paths investigation of the timing signals from Moscow and Irkutsk to antarctic Great Wall Station, *Antarctic research (Chinese edition)***, Mar. 1994, 6(1), p.58-62, In Chinese with English summary. 4 refs.

In this paper, the measurement method of radio wave propagation delay with the time signals from RWM (Moscow) and RID (Irkutsk) stations to the Great Wall Station is introduced. Based on the propagation delay data measured from Apr. 1991 to Sep. 1991, the propagation paths are analyzed. The propagation time blocks over long and short great-circle paths are illustrated. (Auth. mod.)

K-51090

Foppiano, A.J., Rodger, A.S., **F-region ionospheric irregularities over King George Island and Argentine Islands—a comparative study, *Antarctic science***, Sep. 1994, 6(3), p.411-417, Refs. p.416-417.

Estimates of spread-F in the vicinity of the maximum plasma frequency of the F layer (F_oF_2) have been determined at 15 min intervals from ionograms recorded over a ten day period (May 1-10, 1986) on King George I. and Argentine Is. The interval at low solar activity includes periods of quiet and disturbed geomagnetic activity. Spread-F is observed on every night at both stations. It is more frequent, slightly more intense and starts earlier at Argentine Is. than at King George I. On most nights, spread-F ceases about local sunrise at 120 km altitude at both stations. On the days of highest geomagnetic activity, the onset of spread-F is delayed compared with days of lower activity. Spread-F is usually most intense on the night(s) following the highest geomagnetic activity level. The growth rate of the plasma instability processes causing the ionospheric irregularities is inversely related to electron concentration ($f_oF_2^2$), amongst other parameters. Thus the lower f_oF_2 values over the Argentine Is. are consistent with more spread-F being observed by the higher latitude observatory. (Auth. mod.)

K-51123

Beaman, J., et al, **Performance of the South Pole Air Shower Experiment during 1987 to 1992, *Physical review D***, Nov. 15, 1993, 48(10), p.4495-4503, 12 refs.

Described here is the performance of an extensive air shower array sited at the geographic South Pole from its construction in 1987 to the austral summer of 1991. The stability of the array over this four year period when the detectors were subjected to temperature cycling over a 60 C range is evaluated. The analysis techniques used to determine the core position and direction of the shower are discussed, along with checks on the angular resolution and pointing accuracy of the array, which were 0.09 and 0.2 ± 0.5 deg respectively. (Auth.)

K-51124

Van Stekelenborg, J., et al, **Search for point sources of ultrahigh energy gamma rays in the southern hemisphere with the South Pole Air Shower Experiment, *Physical review D***, Nov. 15, 1993, 48(10), p.4504-4517, 83 refs.

Reported here are the results of a search for point sources of ultrahigh energy Γ radiation in data collected in 1988, 1990, and 1991 by the South Pole Air Shower Experiment. Nine predefined point sources were investigated: the x-ray binaries SMC X-1, LMC X-4, Cen X-3, Vela X-1, 4U1626-67, 4U1145-61, the supernova 1987A, the globular cluster 47 Tucanae, and the unconfirmed source BL-1. No conclusive evidence was found for dc emission from any of the nine candidates. An all sky search for a time-averaged signal was performed, but no significant excess was found. There was a 95% C.L. flux limit of $2.0 \times 10^{-13} \text{ /sq cm/s}$ above 50 TeV for all sources, with the exception of Vela X-1 where the authors have set the limit at $0.6 \times 10^{-13} \text{ /sq cm/s}$ above 200 TeV. The four x-ray binaries SMC X-1, LMC X-4, Cen X-3, and Vela X-1 were investigated for Γ -ray emission modulated with the orbital period. No evidence for a modulated Γ -ray signal was found. A search for sporadic emission from the nine sources was conducted on time scales of one hour, one day, and one week. The hourly and weekly burst searches were unsuccessful, but a statistically significant excess from SMC X-1 (99.6% C.L.) was detected during one day in 1991: 178 events on-source versus 120 background events. (Auth. mod.)

K-51161

Smith, R.W., et al, **June 1991 thermospheric storm observed in the Southern Hemisphere, *Journal of geophysical research***, Sep. 1, 1994, 99(A9), p.17,609-17,615, Refs. p.17,614-17,615.

Neutral upper thermospheric wind and temperature measurements obtained at Amundsen-Scott Station and Mt. John, New Zealand during the storm period June 11-13, 1991 are presented. Winds peaking at about 800 m/s and typical temperatures reaching up to 2000 K were found in the polar cap. Peak winds above Mt. John reached 300 m/s in response to the strong high-latitude forcing which had spread equatorward to mid-latitudes. The temperature predictions of the MSIS 86 model were in broad agreement with the observations but were overestimated by several hundred degrees near 0800 UT on June 12 and underestimated by a similar amount near 0800 UT on June 13. The observed meridional winds at South Pole were less uniform and a few hours different in phase than indicated by the vector spherical harmonic (VSH) model predictions. Although the wind magnitudes were similar to VSH at most times, there was a 12 hour difference in phase in the zonal component. For the Mt. John observations the VSH model predictions exaggerated the equatorward penetration of the polar thermospheric circulation relative to the observations. It is suggested that the sign of the interplanetary magnetic field Y component is an important factor which determines how momentum is coupled between high and middle latitudes during storms and that it will be needed in the specifications for models such as VSH. (Auth. mod.)

K-51162

Van Allen, J.A., **1957 survey of cosmic ray intensity, 0 to 25 km altitude and 86N to 73S geomagnetic latitude, *Journal of geophysical research***, Sep. 1, 1994, 99(A9), p.17,631-17,636, 7 refs.

During 1957, as part of the program of the International Geophysical Year, the University of Iowa conducted a survey of cosmic ray intensity with equipment on balloon-launched rockets ("rockoons") over the range of geomagnetic latitude λ from 86N to 73S. This paper reports the results obtained up to altitudes of about 25 km from the flights of 26 bal-

loons. The epoch of the observations was near the time of maximum solar activity. A comparison is made with similar observations at $\lambda=52^\circ$ deg in 1953 at a time near minimum solar activity. The mean solar modulation factor is 0.69 at altitudes ranging from 10 to 20 km. (Auth. mod.)

K-51198

Clilverd, M.A., Thomson, N.R., Smith, A.J., **Influence of ionospheric absorption on mid-latitude whistler mode signal occurrence from VLF transmitters**, *Journal of atmospheric and terrestrial physics*, Aug. 1993, 55(10), p.1469-1477, 22 refs.

Whistler mode signals from VLF transmitters received at Faraday Station during 1986-1991 show an annual variation in the number of hours over which signals are observed, with a maximum in June and a minimum in Dec. The variation was larger at solar minimum than at maximum and can be understood in terms of changes in absorption of VLF signals in the D-region, where the high geographic latitude of Faraday plays an important role in producing low attenuation levels during the austral winter. In contrast, very little such variation was observed at Dunedin, New Zealand in 1991. Nighttime whistler mode signals have start and end time trends that are consistent with the influence of F-region absorption. Increases in whistler mode occurrence appear to be associated with periods of high geomagnetic activity at solar maximum but not during solar minimum. A possible mechanism involving decreased F-region absorption is discussed. (Auth.)

K-51199

Clilverd, M.A., Clark, T.D.G., Smith, A.J., Thomson, N.R., **Observation of a decrease in mid-latitude whistler mode signal occurrence prior to geomagnetic storms**, *Journal of atmospheric and terrestrial physics*, Aug. 1993, 55(10), p.1479-1485, 16 refs.

VLF whistler mode signals received in 1986-1992 at Faraday Station and Dunedin, New Zealand show night-long decreases in occurrence which may be caused by changes in F-region absorption levels. The whistler mode occurrence normally decreases for one night and can only be detected during periods when whistler mode activity lasting several hours per night is usual. Decreases in occurrence are observed more often at Dunedin than at Faraday, probably due to long sub-ionospheric paths that result in weaker signals being received at Dunedin. The decreases in occurrence appear to be associated with solar disturbances and often occur a day before the onset of geomagnetic activity. Several of the events recur with a 27 day cycle that coincides with favorably placed solar coronal holes. (Auth.)

K-51311

Bieber, J.W., et al, **Long-term variations of interplanetary magnetic field spectra with implications for cosmic ray modulation**, *Journal of geophysical research*, Mar. 1, 1993, 98(A3), p.3585-3603, Refs. p.3601-3603.

Yearly averaged power spectra of interplanetary magnetic field turbulence at 1 AU are calculated over the period 1965-1988 for fluctuations in the frequency range 5.8×10^{-6} to 4.6×10^{-5} Hz, corresponding to periods of 6-48 hours. The spectra are well described by power laws with a typical spectral index of -1.2. Averaged over 24 years, the amplitudes of the component spectra are in the proportion 1.8:1.5:1 for magnetic field components, respectively, in the north-south direction, perpendicular to the Parker spiral in the ecliptic plane, and parallel to the Parker spiral. The amplitudes of the spectra vary with the sunspot cycle and are inversely correlated with the intensity of 10 GeV cosmic rays. Using the observed spectra, the authors calculate a lower limit to the cosmic ray scattering mean free path using resonant magnetostatic quasi-linear theory for both "slab" and isotropic geometries of the turbulence. The mean free paths thus obtained are typically 0.1 AU in the slab model and 0.3 AU in the isotropic model, but they are not significantly correlated with the modulated galactic cosmic ray intensity recorded by neutron monitors. This suggests that the scattering processes described by resonant magnetostatic theory play, at best, a very minor role in the solar modulation of 10 GeV cosmic rays. Data collected are compared with the modulated intensity of cosmic rays recorded by the McMurdo neutron monitor. (Auth. mod.)

K-51312

Pinnock, M., et al, **Observations of an enhanced convection**

channel in the cusp ionosphere, *Journal of geophysical research*, Mar. 1, 1993, 98(A3), p.3767-3776, 30 refs.

This paper describes combined observations by the PACE HF backscatter radar and the DMSP F9 polar-orbiting satellite of a transient velocity signature in the Southern Hemisphere ionospheric cusp. The prevailing solar wind conditions suggest that it is the result of enhanced magnetic merging at the magnetopause. The satellite particle precipitation data associated with the transient are typically cusplike in nature. The presence of spatially discrete patches of accelerated ions at the equatorward edge of the cusp is consistent with the ion acceleration that could occur with merging. The combined radar line-of-sight velocity data and the satellite transverse plasma drift data are consistent with a channel of enhanced convection superposed on the ambient cusp plasma flow. This channel is at least 900 km in longitudinal extent but only 100 km wide. It is zonally aligned for most of its extent, except at the western limit where it rotates sharply poleward. Weak return flow is observed outside the channel. These observations are compared with and contrasted to similar events seen by the EISCAT radar and by optical instruments. (Auth. mod.)

K-51382

Engebretson, M.J., et al, **Identification of the boundary layer as the entry point for high-latitude dayside Pc3-4 magnetic pulsations**, *Antarctic journal of the United States*, 1992, 27(5), p.299-301, 3 refs.

Based on a geomagnetic pulsation study, the authors conclude two things: first, because the auroral and magnetic pulsations are strongly linked to "upstream waves" impinging on the earth's magnetosphere from the solar wind, monitoring of auroral pulsations near the zenith provides an effective way of locating the position of the boundary layer from ground observatories. Secondly, the data are consistent with the hypothesis that Pc3-4 pulsations reach very high latitudes via modulated electron precipitation, which produces increases in the auroral conductivity and currents.

K-51383

Parks, G.K., et al, **Images and energy spectra of an impulsive X-ray burst observed in the antarctic polar cap region**, *Antarctic journal of the United States*, 1992, 27(5), p.301-304, 5 refs.

In 1990 a balloon launched into a circumpolar trajectory from McMurdo Station carried an X-ray pinhole camera and a high-energy-resolution germanium spectrometer. Impulsive X-ray events were detected on Dec. 23, 24, and 25, 1990. All were observed on the dayside, inside the polar cap region and to the south of the predicted auroral zone but fairly close to the southward boundary. The impulsive burst on Dec. 25 is associated with the earth's magnetospheric activity. A figure shows raw images that represent two-dimensional contours of constant X-ray fluxes at the position of the detector plane (about 40 km in altitude). These images indicate that electron precipitation can be beamlike and can occur over a small region, about 15-20 km. That dimension is close to the limit of the instrument's capability and suggests that the actual spatial region could be even smaller. The authors conclude that their observations from the polar cap region provide the first quantitative small-scale X-ray images and simultaneous energy spectra.

K-51384

Bering, E.A., Benbrook, J.R., Liao, B., **Intense 2.3 hertz electric field pulsations in the stratosphere at high auroral latitudes**, *Antarctic journal of the United States*, 1992, 27(5), p.304-306, 5 refs.

This paper reports results from the analysis of ultra-low frequency (ULF) fluctuations observed by electric field detectors flown on stratospheric balloon payloads from Amundsen-Scott Station. The electric field data were acquired during the 1985-1986 South Pole balloon campaign in which 8 balloon payloads carrying 3 axis double-probe electric field detectors were launched sequentially. The authors obtained the data discussed here during flight 3, which reached float altitude around 2345 universal time on Dec. 21, 1985. They observed narrow bandwidth pulsations in the horizontal component of the electric field with an amplitude of about 40 to 60 millivolts/m at a frequency of 2.3 hertz. The vertical component had similar signals, with amplitudes of about 70 to 200 millivolts/m. The waves occurred in bursts of 5 to 15 sec in duration at irregular 1- to 2-min intervals. The event began around 0015 universal time on Dec. 22, 1985

and lasted about 3 hours. A figure shows an example of one of these wave bursts. Unusual signals are discussed and several possibilities for their sources are suggested.

K-51385

Few, A.A., et al, **Surface observations of global atmospheric electric phenomena at Amundsen-Scott South Pole Station**, *Antarctic journal of the United States*, 1992, 27(5), p.307-309, 5 refs.

Instruments for measuring the atmospheric electric field and current were deployed at Amundsen-Scott Station in Jan. 1991. The data acquired at 3 m above the antarctic plateau surface are directly related to global electric circuit parameters, in particular the ionospheric potential. The data allow the authors to continuously monitor the global electrical circuit from surface measurements.

K-51386

Singh, S.P., Rosenberg, T.J., LaBelle, J., **Correlated bursts of AKR, VLF, and HF noise associated with an isolated dayside magnetic impulse**, *Antarctic journal of the United States*, 1992, 27(5), p.309-311, 15 refs.

The present study attempts to identify correlated VLF/HF noise emission events using riometer and VLF data from Amundsen-Scott Station. The riometer is an instrument that uses background HF cosmic radio noise to measure the opacity of the D and the E regions of the ionosphere. The incoming radiation is compared with the expected value at quiet conditions to yield the absorption. Data from most of 1984 and the beginning of 1989 were examined. From among the events discovered, the one presented here was most notable for its association with an auroral kilometric radiation (AKR) event. AKR is an intense electromagnetic radiation emitted from the earth towards outer space, and hence is not observable on the ground.

K-51387

Wang, Z., Rosenberg, T.J., **Riometer signature of the cusp**, *Antarctic journal of the United States*, 1992, 27(5), p.312-313, 7 refs.

Motivated by the request to search for cusp ionospheric signatures in ground-based data, and to intercalibrate the signatures identified by different observing techniques, the authors asked the question: "Is there a riometer signature of the cusp?" One's initial guess might be to answer no because auroral cosmic noise absorption, as measured by riometers, is thought to arise from enhanced ionization in the D region and the cusp particle distribution is composed of electrons too low in energy to reach that depth (70-90 km) in the atmosphere. The result of the authors' search, however, suggests that there is a riometer absorption signature of the cusp. The effect occurs in the F region at an altitude of approximately 250 km and is related to the production in the cusp of patches of greatly enhanced ionization that subsequently drift into the polar cap.

K-51389

Gundersen, J., Schuster, J., Gaier, T., **South Pole anisotropy measurements of the cosmic microwave background radiation at 1 degree using a 25-35 gigahertz (GHz) HEMT receiver**, *Antarctic journal of the United States*, 1992, 27(5), p.316-317, 7 refs.

Anisotropy measurements of the cosmic microwave background radiation (CMBR) provide a critical test for cosmological theories and have been placing ever greater constraints on theories of large-scale structure formation in the universe. During the austral summer of 1990-1991 the authors took three instruments to Amundsen-Scott Station to study anisotropy in the CMBR. These three instruments were designed to measure anisotropies in the CMBR at seven different frequencies, ranging from 15 to 90 GHz, and at 3 different angular scales ranging from 30 min to 10 deg. The 1990-1991 measurements represent the most sensitive measurements of CMBR anisotropy made to date. The data from one of the elevations in the nine point raster scan have been analyzed in detail, as shown in a figure. The lower frequencies have strong detections present, while the higher frequencies do not.

K-51390

Bieber, J.W., Evenson, P., Lin, Z., **Cosmic ray trajectories in the**

Tsyganenko magnetosphere, *Antarctic journal of the United States*, 1992, 27(5), p.318-319, 7 refs.

In order to analyze anisotropies detected with ground-based instrumentation, one must take account of the effect of the geomagnetic field and magnetosphere. Generally one is interested in the "asymptotic direction" of the particle, i.e., its direction of approach before it encountered earth's magnetosphere. To determine asymptotic direction, the particle's trajectory is numerically traced backwards through a model magnetosphere until it crosses the magnetopause. The results of such computations are available in the form of tables such as those presented by Gall et al. (1982), which list asymptotic directions for vertically incident particles as a function of station location, particle rigidity, and time of day. The use of tables, however, necessarily involves a number of compromises: one must invariably interpolate between table entries when analyzing actual data. The present paper describes efforts to eliminate the need for such tables through implementation of an accurate trajectory-tracing code in a realistic new model of earth's magnetosphere. It is concluded that use of the Tsyganenko magnetosphere model in particle trajectory-tracing codes will significantly advance the capability to make high accuracy measurements of cosmic ray anisotropies.

K-51391

Salamon, M.H., et al, **Flight of the MAGPIE: measuring the isotopic composition of the cosmic ray ion group**, *Antarctic journal of the United States*, 1992, 27(5), p.320-321, 8 refs.

The Magnetic Passive Isotope Experiment (MAGPIE) was designed to measure the isotopic composition of the iron-group nuclei (manganese through nickel) in cosmic radiation within the energy interval 0.1-1.0 billion electron volts per nucleon. The Antarctic provides a unique opportunity to achieve long-duration balloon flights. In contrast to the one to two days of flight usual for mid-latitude launches, heavy payloads can now be kept aloft for several weeks, thus dramatically increasing the statistical significance (and science return) of these balloon-borne experiments. The authors' payload with a scientific weight of 907.19 kg was flown with a 8,991,600 m balloon in Dec. 1991 from Williams Field, near McMurdo Station. Analysis of the data from the MAGPIE flight is presently under way.

K-51392

Jefferies, S.M., Pomerantz, M.A., Harvey, J.W., Duvall, T.L., Jr., **Helioseismology from the South Pole: surprises from near the solar surface**, *Antarctic journal of the United States*, 1992, 27(5), p.322-323, 9 refs.

Helioseismology is the study of the properties of the solar interior through measurement of the sun's natural acoustic oscillations. These oscillations are observed at the solar surface as upward and downward motions and also as intensity variations. The South Pole is a uniquely advantageous site for obtaining helioseismology measurements because long-duration observations interrupted only by poor weather are possible during the austral summer. This advantage has been used frequently since 1979. At low frequencies, the authors' observations of the solar oscillation spectrum show that spectral features associated with trapped modes are asymmetric in frequency. The asymmetry results from the interference of waves that travel directly from the source to the surface with those that travel downward, are trapped in an acoustic cavity, and are seen at the surface only as leakages from the cavity.

K-51393

Doolittle, J.H., **Automatic geophysical observatories prepared for the polar cap network**, *Antarctic journal of the United States*, 1992, 27(5), p.323-324.

Deployment of a network of six unmanned automatic geophysical observatories (AGOs) is planned on the antarctic polar plateau. Coordinated investigations of the high-latitude ionosphere and magnetosphere will be carried out by several identical experiments operated synchronously at each site. Planned locations for the AGOs, shown in a figure, were selected to provide a meridional array from the geomagnetic pole (near Dome C) through Amundsen-Scott Station, another meridional array one-and-a-half hours in geomagnetic time to the east, and an arc of AGOs along the 80 deg invariant magnetic latitude. The polar cap network will include several manned stations where similar experiments are on-going.

K-51394

Feffer, P.T., Lin, R.P., **Gamma-ray and hard X-ray spectroscopy on a long-duration balloon flight**, *Antarctic journal of the United States*, 1992, 27(5), p.325-326, 6 refs.

Solar flares, which are explosions in and near sunspots, are the most powerful natural particle accelerators in our solar system. The balloon-borne High-Resolution Gamma-ray and Hard X-ray Spectrometer (HIREGS) is designed to detect photons from about 20 kiloelectron volts (keV) to about 17 million electron volts (MeV) with an energy resolution of 1.5 to several keV. Long-duration balloon flights in Antarctica during austral summer provide the coverage (24 hours per day for 8 to 14 days) required to have a high probability of catching large solar flares. HIREGS is part of the Max '91 campaign organized to obtain coordinated observations of solar flares over as wide a range of the electromagnetic spectrum as possible during this solar maximum. Preliminary results show that in 128 hours of solar observations, HIREGS did not find any intense hard X-ray and/or gamma-ray bursts from solar flares.

K-51460

Berkey, F.T., Jarvis, M.J., **Observations of the mid-latitude ionospheric trough from Antarctica**, *AGARD conference proceedings*, 1985, AGARD-CP-382, Propagation effects on military systems in the high latitude region, p.4.6/1-4.6/25, 36 refs.

Measurements of the ionosphere using two identical digitally controlled high frequency radar systems have been conducted in Antarctica from Halley and Siple Stations. These stations are uniquely sited, both having essentially identical coordinates of geographic and geomagnetic latitude. Furthermore, due to the large offset of the geographic and magnetic poles in Antarctica, the difference in magnetic local time is less than half the separation in local solar time. In this study, the locations of the minimum and poleward edge of the trough have been found for magnetically quiet intervals and mapped into invariant latitude. Simultaneous measurements of the trough location from Siple and Halley have been compared using magnetic, local and universal time coordinates. For geomagnetically quiet conditions, this analysis suggests that the invariant latitude of the poleward edge has a Universal Time dependence prior to local midnight. (Auth. mod.)

K-51571

Minatoya, H., Ono, T., Sato, N., Makita, K., Yoshino, T., **Development of image data processing system for the conjugate auroral TV data**, *Antarctic record*, July 1994, 38(2), p.113-147, In Japanese with English summary. 24 refs.

An image data processing system has been developed in order to analyze auroral conjugacy of auroral positions, shapes and motions. The new system has the following advantages: 1) a large amount of image data can be quickly and efficiently analyzed. 2) The geomagnetic coordinate display and auroral dynamic display produced by the system are useful for comparison of auroral positions, shapes and motions between two hemispheres. 3) The smooth combination techniques of auroral image data make it possible to investigate auroral conjugacy with a wider field of view than that of one station. The developed processing system is applied to conjugate auroral TV camera data of Sep. 9-10, 1991 events observed at Showa and Asuka stations in Antarctica and Husafell in Iceland. (Auth.)

See also:

E-49938 I-50510 L-50810

L. TERRESTRIAL PHYSICS

L-49585

Kong, X.R., Zhang, J.J., Jiao, C.M., **Deep electrical conductivity structure in the region of Great Wall Station, Fildes Peninsula, West Antarctica**, *Antarctic research (Chinese edition)*, 1993, 5(3), p.40-47, In Chinese with English summary. 6 refs.

In Dec. 1992, three sites for magnetotelluric (MT) measurements were selected in the Great Wall Station region. The Magnetotelluric Measurement Station MMS02 system was used throughout the survey. Results show that the electrical conductivity major axis of Wind Valley Fault is around 110NE and the thickness of the crust in the Fildes Peninsula is about 22.3 km. The crust includes four main electrical conductivity layers with thicknesses of 1.3 km, 6.7 km, 1.2 km, and 13.1 km respectively. The upper crust is 9.2 km and lower crust is 13.1 km. (Auth. mod.)

L-49650

Hole, M.J., Rogers, G., Saunders, A.D., Storey, M., **Relation between alkalic volcanism and slab-window formation**, *Geology*, June 1991, 19(6), p.657-660, 26 refs.

Ridge crest-trench interactions along continental destructive plate margins may result in the development of slab-free windows beneath the continental margin. Slab windows were generated at various locations along the Pacific margin of the Americas and the Antarctic Peninsula during the past 70 m.y. Slab-window formation is temporally and spatially associated with mafic, alkalic volcanism. Lavas erupted above the loci of slab windows are geochemically indistinguishable from some ocean-island, plume-related basalts. However, generation of slab-window basalts from deep-seated mantle plumes requires the fortuitous initiation of plume activity following cessation of subduction. Asthenospheric upwelling and associated decompressional melting following slab-window formation are probably promoted by removal of subducted oceanic lithosphere from beneath the continental margin following the cessation of subduction. Major lithospheric extension is not a prerequisite for alkalic volcanism in this case. The close association of subduction-related volcanism and within-plate alkalic volcanism within the geologic record may also be explained by this mechanism.

L-49669

Grad, M., Guterch, M., Janik, T., **Seismic structure of the lithosphere across the zone of subducted Drake plate under the antarctic plate, West Antarctica**, *Geophysical journal international*, Nov. 1993, 115(2), p.586-600, 40 refs.

Deep seismic sounding measurements were performed in the transition zone between the Drake plate and the antarctic plate in West Antarctica. The interpretation was made with the use of seismic records of four land stations in the South Shetland Is. and Antarctic Peninsula, yielding a 2-D model of the lithosphere down to 80 km depth. The crustal structure beneath the trough of Bransfield Strait is highly anomalous. The presence of a high-velocity body was detected in the 6-30 km depth range. This inhomogeneity was interpreted as an intrusion, coinciding with the Deception-Penguin-Bridgeman volcanic line. The Moho boundary depth ranges from 10 km in the South Shetland Trench area to 40 km under the Antarctic Peninsula. In the transition zone from the Drake Passage to the South Shetland Is., a seismic boundary in the lower lithosphere occurs at a depth ranging from 35 to 80 km. The dip of both the Moho and this boundary is approximately 25 deg, and indicates the direction of subduction of the lithosphere of the Drake plate under the antarctic plate. The results obtained were compared with earlier results of seismic, gravity and magnetic surveys in West Antarctica. A scheme of geotectonic division and a geodynamical model of the zone of subduction of the Drake plate under the antarctic plate is compared with subduction zones in other areas of the circum-Pacific belt. (Auth. mod.)

L-49740

Fujiwara, S., Watanabe, K., **First absolute gravity measurement at Syowa Station**, *Polar news*, Aug. 1992, No.55, p.20-24, In Jap-

anese.

In 1987 the International Union of Geodesy and Geophysics (IUGG) designated Showa Station as one of the stations worldwide in the International Absolute Gravity Base Net (IAGBN). McMurdo is the only other station of the IAGBN also located in Antarctica. Originally, absolute gravity was measured by pendulums but now free-fall gravimeters are used. The first measurements, made in Feb. 1992 as part of the 33rd Japanese Antarctic Research Expedition, derived a tentative value of 982524.241 milligals for absolute gravity, where 1 milligal = .00001 m/s/s acceleration. A sketch map showing the worldwide locations of the IAGBN stations and a photograph and schematic of the Showa Station gravimeter are also included.

L-49835

Bell, R.E., et al, **Airborne gravimetry from a light aircraft, From Mars to Greenland: charting gravity with space and airborne instruments—fields, tides, methods, results**. Edited by O.L. Colombo, New York, Springer-Verlag, 1992, p.225-234, 21 refs.

DLC QE330.E76

Recent data collected from a Cessna 404 over water, and a ski-equipped Twin Otter over a grounded ice sheet, have demonstrated that airborne gravity can recover anomalies with wavelengths greater than about 5 km to accuracies of better than 3 mGal. The Twin Otter experiment was flown over the West Antarctic Rift system, where limited ground truth from surface gravity data exists that was collected in the early 1960s. The results from an overflight of a traverse gravity line indicate that even in this remote location, airborne gravity can recover anomalies with accuracy adequate for geologic studies. The current level of resolution and accuracy from airborne gravity is adequate for tectonic studies and deciphering the history of sedimentary basins, but it falls short of the high resolution required for detailed studies of intrusive features, hydrothermal deposits, and other small yet important geologic features. (Auth. mod.)

L-49857

Danske, D., ed, Fritsch, J., ed, **German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V, Geologisches Jahrbuch. Reihe E**, 1993, Vol.47, 436p., With German and Russian summaries. Refs. passim. For individual papers see B-49858, E-49869, E-49872 through E-49876, F-49867, L-49859 through L-49866, L-49868, L-49870 and L-49871.

The 5th German Antarctic North Victoria Land Expedition (GANOVEX V) took place in the antarctic summer of 1988-89. It comprised geological as well as geophysical work. This volume deals mainly with the geophysical work carried out during the GANOVEX V expedition or in conjunction with it. The principal objective was to obtain information on the structure of the earth's crust at the transition zone between the Transantarctic Mountains and the Ross Sea in the vicinity of Terra Nova Bay, using onshore and offshore seismic refraction geophysics. Seismic signals were generated at sea by airguns and recorded at sea by ocean-bottom seismographs (OBS) and on land by automatic recording stations. This combination of onshore and offshore seismics was quite new under antarctic conditions and difficult to perform due to the difficulties in logistics and the unpredictability of antarctic weather. Geological investigations were concentrated in the areas around Terra Nova Bay, Mariner Glacier, Rennick Glacier and the Oates Coast. Some of the papers describing this work are included in this volume; most of them, however, will be published in a second GANOVEX V volume at a later date.

L-49859

Tessensohn, F., **Crustal investigations in the Transantarctic Mountains: the concept for the GANOVEX V Expedition**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.39-48, With German and

Russian summaries. 51 refs.

GANOVEX V combined geological and geophysical investigations, having these main objectives: (1) to investigate the structure of the crust at the western flank of the Cenozoic Ross Sea rift system, and (2) to study the petrology, geochemistry, and metamorphic and structural history of the Paleozoic Ross Orogen. The expedition was based on results of previous geophysical work onshore, carried out mainly during GANOVEX IV, and offshore marine multichannel seismic work conducted in the Ross Sea by several institutions. The main scientific project of GANOVEX V was an onshore-offshore experiment at right angles to the main structural grain. Airguns from the expedition vessel were used as seismic sources, and automatic recording stations on the sea bottom and onshore on rock and ice registered these signals. The scientific questions behind the experiment are laid out in this article. Objective (2) covered a wide field of research and several areas geographically distant from each other, i.e. Terra Nova Bay, the Mariner Glacier, and the Oates Coast northwest of Victoria Land. As time-consuming laboratory work forms a major part of these investigations, only the very first papers are included here. Two more scientific volumes are in preparation on these subjects. (Auth. mod.)

L-49860

Behrendt, J.C., Damaske, D., Fritsch, J., **Geophysical characteristics of the West Antarctic rift system**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.49-101, With German and Russian summaries. Refs. p.93-101.

The West Antarctic rift system extends over a largely ice-covered area (750 km x 3000 km) from the Ross Sea to the Bellingshausen Sea, comparable in area to the Basin and Range region of North America and the East African rift system. The rift shoulder has a maximum physiographic relief of 5 km in the Ross Embayment and 7 km in the Ellsworth Mountains-Byrd Subglacial Basin area. This rift system is characterized by bimodal alkaline volcanic rocks ranging from about Oligocene or earlier to the present. Widely spaced aeromagnetic profiles in West Antarctica indicate the absence of Cenozoic volcanic rocks in the ice-covered part of the Whitmore-Ellsworth Mountain block, and suggest their widespread occurrence beneath the western part of the ice sheet overlaying the Byrd Subglacial Basin. A BGR-USGS aeromagnetic survey over the Ross Sea continental shelf indicates rift fabric and suggests numerous submarine volcanoes along discrete NNW-trending zones. Large-offset seismic profiles over the Ross Sea shelf obtained by GANOVEX V, combined with earlier USGS and other results, indicate a thickness of 17-21 km for the crust in the Ross Sea, interpreted as evidence of extended continental crust. A regional positive gravity anomaly extends from the Ross Sea continental shelf throughout the subglacial area of the West Antarctic rift system and indicates that the crust is approximately 20 km thick, rather than the 30 km reported in earlier interpretations. (Auth. mod.)

L-49861

Danske, D., **Geomagnetic activity in north Victoria Land during GANOVEX V**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.103-114, With German and Russian summaries. 3 refs.

Geomagnetic activity was monitored in conjunction with an aeromagnetic survey program during the 1988-89 GANOVEX V expedition. A magnetic base station was installed at Gondwana Station, providing 21 days of uninterrupted data recorded at one-minute intervals. The pattern of magnetic activity appears to be virtually unchanged since the GANOVEX IV observations in 1984-85: strong disturbances in the early morning hours until noon local time, and a reduced level of activity for the remainder of the day. Basically, the same pattern was found for the area of the lower Rennick Glacier, where in the Kavrayskiy Hills the magnetic activity was monitored on 44 consecutive days. (Auth.)

L-49862

Damaske, D., **Layout, execution, and data processing of the aeromagnetic survey in the lower Rennick Glacier area, north Victoria Land, Antarctica**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch,

p.115-137, With German and Russian summaries. 12 refs.

During the GANOVEX V expedition, an aeromagnetic survey was conducted in the area of the lower (northern part) Rennick Glacier and the neighboring parts of the Bowers Mountains, Usarp Mountains, and the Polar Plateau. The survey was set up as a conventional regional survey with profile lines 4.4 km apart and a tie line spacing of 22 km. The survey was flown at constant barometric altitude, i.e. 4500 ft (1370 m) over the Rennick Glacier and the low parts of the northern Bowers Mountains and 9000 ft (2745 m) over the remainder of the area. The magnetometer system was installed in one of the AS350 expedition helicopters; the sensor was housed in a bird towed on a 30 m long cable. The Trident IV radio location system using radio beacons installed in the survey area was used for navigation. The survey was conducted from a small field camp in the Kavrayskiy Hills on 12 days over a period of less than four weeks. A total of 5779 km of survey lines were flown. Following processing of the data at the PRAKLA-SEISMOS data center in Hannover, maps of the anomalies of the total magnetic field were produced covering about 15,000 km². (Auth. mod.)

L-49863

Damaske, D., Bosum, W., **Interpretation of the aeromagnetic anomalies above the lower Rennick Glacier and the adjacent polar plateau west of the USARP Mountains**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.139-152, With German and Russian summaries. 8 refs.

Four significant major magnetic units can be distinguished on the anomaly maps of the total magnetic field of the lower Rennick Glacier and adjacent areas. A quiet magnetic pattern is characteristic for the area of the rocks of the Robertson Bay Group. The pattern changes abruptly at the eastern edge of the lower Rennick Glacier along a line that extends northwards into the sea: extensive positive anomalies dominate the Rennick graben area as far as just west of the Kavrayskiy Hills. It is interesting to note that these anomalies do not continue to the south, i.e. they do not follow the Rennick graben structure; they appear to be cut off at a NW-SE-trending lineament, possibly indicating an older structural boundary. Further to the west the magnetic pattern above the Usarp Mountains and the adjacent parts of the polar plateau appears flat. A magnetic lineament that is in line with the Matusевич Glacier marks another significant boundary. It can be interpreted as a fault within the platform or even the boundary of the East Antarctic shield itself; the magnetic pattern in the westernmost part of the survey indicates a signature closely related to a fringe of an "old shield" area. (Auth.)

L-49864

Heimberg, F., Seeber, G., Damaske, D., **Precise onshore and offshore positioning with the global positioning system during GANOVEX V**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.153-168, With German and Russian summaries. 3 refs.

The global positioning system (GPS) with the TI4100, Trimble 4000SL and Trimble 4000SX receivers in kinematic and static mode was used for seismic, geomagnetic and gravimetric observations during the GANOVEX V expedition. A short review of the basic GPS observation technique is given, and the GPS measurements onshore and offshore are described. The data were processed with GEONAP software. Results and accuracy estimates are discussed. (Auth.)

L-49865

Redfield, T., Kienle, J., Heimberg, F., **Complete Bouguer gravity map of the Mount Melbourne quadrangle, north Victoria Land**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.169-184, With German and Russian summaries. 17 refs.

A set of high quality gravity data was acquired in the Mt. Melbourne quadrangle during the first leg of the GANOVEX V expedition to Terra Nova Bay from Dec. 12, 1988 through Jan. 10, 1989. Sixty gravity stations were established, 33 with Global Positioning satellite navigation System (GPS) elevation control. Most GPS elevations were accurate to

within 1 m. All stations were sited on bedrock and have been terrain corrected. Corrections for the gravitational effects of ice were estimated from two- and three-dimensional gravity models of plausible ice-rock interfaces. A complete Bouguer anomaly gravity map of the Mt. Melbourne quadrangle reveals a strong negative gravity gradient of about 2 mGal/km from Terra Nova Bay towards the Transantarctic Mountains. The gravity field changes from about 20 mGal near the coast to approximately -150 mGal at the crest of the Transantarctic Mountains. The GANOVEX V data link well with those of Dürbaum et al. (1989) on the Polar Plateau to the west. Their lowest Bouguer gravity value is about -300 mGal, 200 km inland from the coast. (Auth. mod.)

L-49866

Redfield, T., Kienle, J., Heimberg, F., **Complete Bouguer gravity map of north Victoria Land between the Rennick and the Matusovich Glaciers**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.185-195, With German and Russian summaries. 6 refs.

Fifty-nine gravity stations were established during the second leg of the GANOVEX V expedition between Jan. 13 and Mar. 2, 1989. Fifty-four stations were located on bedrock. All but five stations were controlled by Global Positioning satellite navigation System (GPS) measurements. All stations were terrain corrected. As the region has extensive ice cover, an additional compensation was required. Corrections for the gravitational effect of glacier ice were estimated from two- and three-dimensional gravity models of plausible ice-rock interfaces at each station. A complete Bouguer anomaly map is presented for the North Victoria Land coast between the Rennick and Matusovich Glaciers. The map shows long-wavelength regional features, including pronounced gravity lows over the northern end of the Usarp Mountains and near the Morozumi Range in the Rennick structure. The two lows are not believed to be artifacts caused by insufficient correction for ice. They are interpreted as representative of the deep crustal structure underlying the northern end of the Transantarctic Mountains. (Auth.)

L-49868

Fritsch, J., Kewitsch, P., **Gravity measurements in the western Ross Sea**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.211-228, With German and Russian summaries. 7 refs.

Gravity measurements were conducted from Dec. 15, 1988 to Jan. 8, 1989 during the GANOVEX V expedition, together with an onshore-offshore seismic survey across the Transantarctic Mountains of North Victoria Land and the adjacent Ross Sea Rift Zone. One of the main objectives of this expedition was to investigate the lower crustal structure of the transition zone between the Transantarctic Mountains and the Ross Sea. A second objective, developed in response to unfavorable ice conditions, was to determine the crustal structure of the Central Trough. The Central Trough is a sedimentary basin in the Ross Sea that is coincident with a pronounced gravity high. Because the refraction seismic lines had to be traversed several times, the gravity data could be replicated. Therefore, the precision of the gravity values along the seismic lines is estimated to be a few tenths of a mGal. The free-air anomalies serve to improve the interpretation of the seismic lines. (Auth.)

L-49870

Makris, J., et al, **Seismic study of the central basin of the Ross Sea, Antarctica**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.277-290, With German and Russian summaries.

A wide-angle reflection/refraction seismic survey was conducted in the Central Basin of the Ross Sea during the 1988-89 antarctic summer. Eighteen Ocean Bottom Seismographs (OBS) recorded shots fired by a 43.5-l airgun array on an E-W profile. The energy waves propagated very efficiently and the large number of observed time-distance curves permits the construction of a well constrained model for the seismic structure of the Central Basin. A sedimentary cover of up to 7 km thickness was identified in the central part of the Basin, including a low velocity zone within the sequence. The crustal structure corresponds to an asymmetric graben

with a steep slope on the west side and a gentler slope (1/3 as steep) on the east side. The crust on both sides is continental, nearly 25 km thick on the east side and 20 km thick on the west side. The velocity structure to the east shows lower values than those observed to the west; this is due to the presence of more high velocity/high density upper mantle intrusives on the western side of the graben. The asymmetric geometry is explained by deformation perpendicular to the profile across the graben. It is assumed that considerable wrench faulting occurred along the rift before the crust was subjected to major extension. Low Pn values of only 7.7 km/s suggest recent reactivation of the rifting. Stretching was considerable; however, nowhere did this cause crustal fragmentation with the formation of oceanic crust. A midcrustal reflection (P(i)P) was identified in most sections, indicating the intact continental character of the crust. (Auth. mod.)

L-49871

Tréhu, A., Behrendt, J.C., Fritsch, J., **Generalized crustal structure of the central basin, Ross Sea, Antarctica**, *Geologisches Jahrbuch. Reihe E*, 1993, Vol.47, German Antarctic North Victoria Land Expedition 1988/89. GANOVEX V. Edited by D. Danske and J. Fritsch, p.291-311, With German and Russian summaries. 20 refs.

Existing near-vertical seismic reflection data from the central Ross Sea reveal a sedimentary basin coincident with a 70 mGal positive gravity anomaly; the experiment was designed to discriminate among several possible explanations for this observation. The data reported here indicate that the gravity anomaly is due to a high velocity/high density "rift pillow" in the lower crust beneath the basin that pinches out beneath its flanks. Total crustal thickness beneath both the rift basin and the rift flanks is approximately 19 km, a significant crustal thinning compared to the 30-40 km crustal thickness beneath East Antarctica. The image of the crustal structure derived here suggests a two-stage rift process. During the first stage, the crust was thinned by a factor of 1.5-2.0 throughout the Ross Sea region with only minor generation of melt. During the second stage, rifting became concentrated in a few zones, one of which became the Central Basin, and 7 km of melt was added to the base of the crust as the pre-existing crust was thinned to about 5 km. The balance among crustal thinning, the volume of melt added, and post-rift subsidence and sedimentation was such that the total crustal thickness beneath the basin and flanks are similar. The amount of melt generated as a function of crustal thinning during each stage is consistent with a model of decompression melting of upwelling mantle material. (Auth. mod.)

L-49898

Kaminuma, K., Okano, K., **Icequakes recorded at Syowa Station, Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.1-6, 3 refs.

Icequakes have been recorded by a three-component short-period seismograph at Showa Station since seismic observations were started in 1966. The icequakes are roughly classified into two groups by their waveforms: a high frequency type and a low frequency type. Icequakes of the high frequency type occurred about 1.8 times more often than those of the low frequency type from Feb. 1990 to Jan. 1992. In the monthly numbers, there are some swarms. However, in daily numbers, only one icequake swarm of low frequency type was observed. A big tremor was also recorded during the swarm. All icequakes and tremors appear to originate in the continental ice sheet. Seismic observations at Showa Station seem to be useful for monitoring ice sheet movement. (Auth.)

L-49899

Akamatsu, J., Morinaga, Y., Yamanouchi, T., Zhang, W.J., **Glacier-generated ground motions at Bomi, southeastern Tibet**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.7-16, 9 refs.

Seismic observation was carried out from late July to early Nov. 1992 at Bomi, southeastern Tibet, to assess glacier hazard. Glacier-generated ground motions such as icequakes and continuous vibrations were observed frequently. General features of ground motions were similar to those from antarctic continental glaciers. The continuous vibrations were characterized by monochromatic components, and their peak frequencies were 7.0 to 10 Hz, from which the effective thickness of glaciers was estimated at 25-36 m. Seismic observation is considered useful to monitor and

predict catastrophic glacier movements. Records of continuous vibrations caused by Langhovde Glacier, and of power spectral densities of continuous glacial vibrations in Bomi and East Antarctica, are shown.

L-49900

Sato, T., et al, **Observation of Earth tides and Earth's free oscillations with a superconducting gravimeter at Syowa Station (status report)**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.17-25, 14 refs.

Superconducting gravimeter (SCG) observation is believed to offer high sensitivity and high resolution data for study of the Earth's core dynamics. The authors describe the importance of SCG installation at Showa Station at high southern latitudes for weak signal detection of fluid core resonance, core undertones, Slichter mode, etc. In order to assess the SCG capability as a long-period seismometer, parallel observations using a Streckeisen seismometer and a LaCoste & Romberg type D gravimeter with the same data acquisition systems are planned. Since leakage of liquid helium from the SCG dewar during the installation procedure in JARE-33 delayed the start of the SCG observation, a retrial was performed during JARE-34. The installation proved successful, although fine tuning may still be required. (Auth.)

L-49901

Shibuya, K., **Syowa Station; observatory for global geodesy in Antarctica (a review)**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.26-36, 22 refs.

Through the five-year (1992-1997) earth science programs "Synthetic observations and monitoring of dynamic behavior of the Earth's crust", plans are described to make parallel geodetic observations at Showa Station to study global geodynamics. This report summarizes the present status of VLBI (Very Long Baseline Interferometer) measurements, the GPS (Global Positioning System) international campaign, DORIS (Doppler Orbitography and Radiopositioning Integrated by Satellite) beacon installation, PRARE (Precise Range and Range-rate Equipment) tracking, absolute gravity measurements, superconducting gravimeter observations, geomagnetic variometer observation and ocean tide observations. (Auth.)

L-49902

Nakai, M., Funaki, M., Wasilewski, P., **Magnetic anisotropy of gneissic rocks from the Skarvsnes area, East Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.6, Tokyo, National Institute of Polar Research, 1993, p.37-46, 14 refs.

The relationship between magnetic anisotropy and natural remanent magnetization (NRM) was investigated in gneissic rocks collected from Skarvsnes, Lützow-Holm Bay. About 60% of the samples show clear gneissosity. The samples with gneissic fabric show magnetic anisotropy. The maximum value of Hc and IR and the minimum values of X(diff) coincide with the lineation within a foliation plane. During thermal demagnetization of the samples having stable NRMs, the NRM declinations are gradually shifted toward the direction of lineation, and they are stabilized in a plane within the rock having well developed foliation. The anisotropy tendency is more clearly observed by using the Hc and IR values than X(diff) values. Two kinds of virtual geomagnetic pole (VGP) positions are identified from the Skarvsnes area. The former is consistent (11.2S, 16.0E) with earlier results reported from the Lützow-Holm Bay area, and the latter (2.5S, 63.2E) reflects the magnetic anisotropy resulting from the lineation. (Auth.)

L-49923

Kanao, M., Kaminuma, K., **Broad-band and wide dynamic-range seismic observations with a Streckeisen Seismometer (STS) at Syowa Station, East Antarctica. JARE-33 status report, 1992**, *Antarctic record*, Nov. 1993, 37(3), p.291-318, In Japanese with English summary. 15 refs.

A three-component Streckeisen seismometer (STS) was tested during wintering of the JARE-30 in 1989 at Showa Station. The broad-band and wide dynamic-range digital seismic recording was begun in May 1990 by JARE-31. During the winter season of JARE-33 (from Feb. 1992 to Jan. 1993), both installation conditions and data acquisition system were improved as follows: BRB (Broad-band) velocity output was monitored

by thermal pen recorders and the digital recording systems; digital recording system of LP (Long-period) acceleration output was begun; the UT (Universal Time) system was replaced by GPS (Global Positioning System) satellites instead of the NNSS (Navy Navigation Satellite System); the relation between the drift of the pendulum and temperature change was investigated by monitoring POS (Position) output; and comparison of two vertical sensors under different installation conditions revealed the nature of characteristic noise. (Auth.)

L-49934

Acton, G.D., Gordon, R.G., **Paleomagnetic tests of Pacific plate reconstructions and implications for motions between hotspots**, *Science*, Mar. 4, 1994, 263(5151), p.1246-1254, Numerous refs.

The plate-motion circuit through the South Pacific and Antarctica is shown to fail paleomagnetic tests of consistency. These failures imply that reconstructions of Pacific basin plates relative to surrounding plates inferred from this circuit are systematically in error, and that estimates of motion between hotspots inferred from this circuit are probably too large. Therefore, the motions between hotspots remain poorly known and may be much smaller than previously estimated. (Auth.)

L-49948

Müller, R.D., Royer, J.Y., Lawver, L.A., **Revised plate motions relative to the hotspots from combined Atlantic and Indian Ocean hotspot tracks**, *Geology*, Mar. 1993, 21(3), p.275-278, 28 refs.

Interactive computer graphics were used to find the best fit of dated hotspot tracks on the Australian, Indian, African, and North and South American plates relative to present-day hotspots assumed fixed in the mantle. One set of rotation parameters can be found that satisfies all data constraints back to chron 34 (84 Ma), and supports little motion among the major hotspots in this hemisphere. For times between 130 and 84 Ma, the plate model is based solely on the trails of the Tristan da Cunha and Great Meteor hotspots. This approach results in a location of the Kerguelen hotspot distinct from and south of the Rajmahal Traps for this time interval. Between 115 and 105 Ma, this model locates the hotspot underneath the southern Kerguelen Plateau, which is compatible with an age estimate of this part of the plateau of 115-95 Ma. The model suggests that the 85E ridge between lat 10N and the Afanasiy Nikitin seamounts may have been formed by a hotspot now located underneath the eastern Conrad rise. (Auth. mod.)

L-50026

Morgan, J.P., Sandwell, D.T., **Systematics of ridge propagation south of 30S**, *Earth and planetary science letters*, Jan. 1994, 121(1/2), p.245-258, 32 refs.

New high-resolution Geosat altimetry data south of 30S reveal numerous propagating ridge wakes along intermediate- and slow-spreading ridges. These new examples provide a large enough database to establish systematics of ridge propagation. Almost all active propagating ridge offset (right lateral vs. left lateral) is related to recent changes in spreading direction. There is a significant difference between the propagation of ridges with an axial high morphology which propagate at greater than 50% of their full-spreading rate, and ridges with a median valley morphology which usually propagate at 25% of their spreading rate. The axial high propagators leave behind an asymmetric wake; the outer pseudofault appears as a continuous linear trough/step while the sheared zone appears as a chain of small gravity bumps. While one clearly sees the propagating ridge wakes from offsets greater than 10 km at slow- and intermediate-spreading ridges at ridges spreading faster than 75 mm/yr, the amplitude of the wake topography decreases to the point where one no longer sees these wakes in Geosat altimetry data. The systematics seen in this new data set support a fracture mechanics model for the dynamics of ridge propagation. (Auth.)

L-50114

Woolfe, K.J., **Paleocurrent data from the Beacon Supergroup at Allan Hills and other localities in southern Victoria Land and the Darwin Mountains**, Antarctic Data Series, No.16, Wellington, NZ, Victoria University of Wellington, 1992, 168p.

The seven sections of the work are organized as follows. Section 1 provides a description of the material collected during Victoria University's Antarctic Expeditions VUWAE 33, VUWAE 34, and VUWAE 36. Most of the data were collected in the 1990-91 austral summer, but some date from 1987-88. The data contain nearly 10,000 measurements which were made solely from platform exposures using a variety of sedimentary structures including ripples, decimeter- and meter-scale trough crossbeds, hummocks, swales, parting lineations, channel margins, and logs. Sections 2 through 6 contain the measured data from various localities in southern Victoria Land and the Darwin Mountains. Section 7 describes specific information available in the data file and retrieval procedures for obtaining it.

L-50176

McAdoo, D.C., Marks, K.M., Smith, W.H.F., Lillibridge, J.L., III, **Gravity field of the Ross Sea region from satellite altimetry: geodynamic implications for West Antarctica**, ERS-1 Symposium, 2nd, Hamburg, Germany, Oct. 11-14, 1993. Proceedings. Space at the service of our environment. Vol.2, Paris, European Space Agency, 1994, p.1227-1231, ESA SP-361, 10 refs.

High-resolution marine gravity fields have been constructed for a region offshore of West Antarctica which includes the Ross Sea. These fields were computed on a 5 km grid and derived from a combination of ERS-1, Geosat GM and ERM altimeter data. The authors combined 20 months of ERS-1 data with 58 months of Geosat data and computed a marine gravity field which extends to 78S. ERS-1 data collected during the austral summers of 1992 and 1993 allowed them to extend their gravity field south of 72S, the southern limit of Geosat. In the gravity field, a large negative gravity anomaly of amplitude -70 mGal (and a -66 m geoid low) can be seen in the Ross Sea. Geodynamic model calculations indicate that part of this gravity low may result from a remnant depression of the crust beneath the Ross Sea due to a thick sheet of grounded ice which filled the Ross Embayment at the last glacial maximum. (Auth.)

L-50265

Sakai, H., Keating, B.H., **Paleomagnetism of Leg 119-Holes 737A, 738C, 742A, 745B, and 746A**, Proceedings of the Ocean Drilling Program, Vol.119. Scientific results. Kerguelen Plateau-Prydz Bay, edited by E.K. Mazzullo and N.J. Stewart, College Station, Texas A and M University, 1991, p.751-770, 17 refs.

DLC QE39.T49b

A geomagnetic polarity zonation for the Late Miocene to the Quaternary has been determined from the sediments of the Kerguelen Plateau. Hole 745B on the south Kerguelen Plateau provided the excellent reversal sequence for the last 6 My including the Cobb Mountain event in the Matuyama Chron and the unidentified subchron in the Gilbert Chron. Hole 738C drilled a complete Cretaceous/Tertiary boundary. The volume magnetic susceptibility measurement around the Cretaceous/Tertiary boundary shows high values at the iridium-concentrated region. This supports the results by Worm and Banerjee (1987) that the high susceptibility and iridium concentration coincide at about the Cretaceous/Tertiary boundary. The limestone sequence at Hole 738C from the Turonian to Santonian stage shows a low paleolatitude (54S) compared to the present (64S). This paleolatitude is nearly the same as the Tertiary paleolatitude estimated from paleomagnetic poles of Antarctica. At Hole 742C in Prydz Bay a glacial sequence was penetrated to a depth of 316 mbsf. The magnetic susceptibility of this sequence correlated well with a changes of lithology. (Auth.)

L-50392

Kanao, M., **Seismological bulletin of Syowa Station, Antarctica, 1992**, *Japanese Antarctic Research Expedition. JARE data reports*, Jan. 1994, No.192, 69p., 4 refs.

The observation system at Showa Station is shown in a schematic diagram. The frequency response of the seismometers and epicenter locations of seismic events detected at Showa are shown in graphs and charts. Read-out data and a list of the 614 earthquakes detected are given in tables, and an appendix contains reproductions of seismic records.

L-50503

Wüster, J., Eckstaller, A., Miller, H., **Seismological research at Georg-von-Neumayer base, Antarctica. Part 1: The seismo-**

logical observatory, *Polarforschung*, 1992 (Pub. 1993), 62(1), p.27-38, 16 refs.

Since 1982, seismological observations have been continuously carried out at the Georg von Neumayer Station (GvN), located on a floating ice shelf, resulting in some reduction in the quality of the data. These site-caused disadvantages enable a number of special investigations, like the analysis of icequakes, the dispersion of flexural waves within the ice-shelf or the transmission of vertically polarized S-waves. Besides the geophysical observatory itself, a network of several remote stations is also operated. This network allows, within some limits, the determination of apparent velocities and azimuths so that for nearer teleseismic events a sufficiently accurate localization of earthquakes can be realized. It was shown that ISC locations of earthquakes in the South Sandwich Is. area are probably systematically biased. Some earthquakes within the antarctic continent could also be detected. Furthermore, the observations allow certain conclusions to be drawn about the structure of the deeper earth below the area of the GvN station. (Auth.)

L-50504

Eckstaller, A., Miller, H., **Seismological research at Georg-von-Neumayer base, Antarctica. Part 2: the analysis of travel time residuals**, *Polarforschung*, 1992 (Pub. 1993), 62(1), p.39-50, 15 refs.

The analysis of teleseismic travel time residuals is one of the classical methods in seismology by which often basic models of the structure and the physical properties of the earth's crust and the upper mantle beneath the receiver station can be derived. The purpose of this work was to detect possible anomalous structures of the deeper earth beneath the Georg von Neumayer Station (GvN). For a comparative analysis, data of other seismological stations in the Queen Maud Land area were incorporated: SANAE (SNA), Novolazarevskaya (NVL) and Showa (SYO). For the computation of relative travel time residuals, which are less contaminated by errors, data of Amundsen-Scott Station (SPA) were used. Because the data of all stations are characterized by a very unequal azimuthal distribution and also by large scattering, appropriate methods for a suitable data reduction had to be developed. Two different methods with equivalent results are presented. At the stations GvN, SNA and NVL the azimuthal variation of the residuals is very similar. The general and relatively great delays at these stations indicate a low velocity zone within the upper mantle below Queen Maud Land. There are some indications that this result can be correlated with a marked, widely spaced negative anomaly of the magnetic field (satellite data). The residual variation at the SPA station yields the conclusion that the residuals may partly be influenced by an anomalous structure below the Transantarctic Mountains. (Auth. mod.)

L-50627

Fullerton, L.G., Frey, H.V., Roark, J.H., Thomas, H.H., **Contributions of Cretaceous Quiet Zone natural remnant magnetization to Magsat anomalies in the southwest Indian Ocean**, *Journal of geophysical research*, June 10, 1994, 99(B6), p.11,923-11,936, Refs. p.11,934-11,936.

The Magsat magnetic anomalies over the southwest Indian Ocean are modeled using a combination of induced plus viscous remanent magnetization (IM/VRM) and natural remanent magnetization (NRM). Two broad, roughly parallel SW to NE trending triple-peaked positive anomalies dominate the region, one lying south of Africa and the other north of Antarctica. Although these anomaly peaks generally correspond with the Agulhas Plateau/Maud Rise, Mozambique Plateau/Astrid Ridge, and Madagascar Ridge/Conrad Rise conjugate pairs, the IM/VRM contribution from structural characteristics (i.e., crustal thickness) accounts for only about 20% of the anomaly amplitudes. A spatially variable but observationally constrained NRM contribution in Cretaceous Quiet Zone (KQZ) crust is required to account for the location, shape, and amplitude contrast of these anomalies. Many crustal features in the southwest Indian Ocean near Antarctica have little geophysical data to constrain their structure, but do have tectonic conjugates near Africa for which much more geophysical data are generally available. Using geophysical and geological constraints from one member to model the magnetization structure of its conjugate reproduces the observed Magsat reduced-to-pole anomalies over both structures very well. (Auth. mod.)

L-50671

Grad, M., Guterch, A., Janik, T., Sroda, P., **2-D seismic models of**

the lithosphere in the area of the Bransfield Strait, West Antarctica, Polish polar research, Dec. 1993, 14(2), p.123-151, Refs. p.148-151.

During the Polish Antarctic Geodynamical Expeditions in 1979-91, deep seismic sounding measurements were performed in the transition zone between the Drake and South Shetland Microplates and the Antarctic Plate in West Antarctica. For the Bransfield Strait area, the seismic records of 5 land stations in the South Shetland Is. and 2 stations at the Antarctic Peninsula were used. The interpretation yielded two-dimensional models of the crust and lithosphere down to 80 km depth. In the uppermost crust, the unconsolidated and poorly consolidated young sediments with velocities of 1.9-2.9 km/s cover the layers 4.0-4.2 and 5.6-5.9 km/s. The crustal structure beneath the trough of Bransfield Strait is highly anomalous. The Moho boundary depth ranges from 10 km beneath the South Shetland Trench to 40 km under the Antarctic Peninsula. In the transition zone from the Drake Passage to the South Shetland Is., a seismic boundary in the lower lithosphere occurs at a depth ranging from 35 to 80 km. The dip of both the Moho and this boundary is approximately 25 deg, and indicates the direction of subduction of the Drake Plate lithosphere under the Antarctic Plate. The results obtained were compared with earlier results of seismic, gravity and magnetic surveys in West Antarctica. A scheme of geotectonic division and a geodynamical model of the zone of subduction of the Drake Plate under the Antarctic Plate is compared with subduction zones in other areas of the circum-Pacific belt. (Auth. mod.)

L-50727

Shearer, P.M., **Global seismic event detection using a matched filter on long-period seismograms**, *Journal of geophysical research*, July 10, 1994, 99(B7), p.13,713-13,725, 30 refs.

An image derived by stacking long-period seismograms is used as an empirical matched filter to detect and locate earthquakes. Records from 564 events (Mb more than 6) recorded at very long periods (T more than 60 s) by the 15 to 20 stations of the International Deployment of Accelerometers (IDA) network, including Amundsen-Scott Station, are stacked using a method that emphasizes the surface wave arrivals. The first 3 hours of this time versus range image are used to construct a matched filter for continuous application to the IDA data. The output of this filter contains spatial and temporal peaks that define the location and origin time of probable seismic events. Application of this technique to 11 years of IDA data from 1981 to 1991 identifies 4061 events. These include 65% of cataloged events of Mb more than 5.5. Earthquakes which appear anomalously strong relative to their surface wave magnitudes are mainly located on oceanic transform faults and probably represent unusually slow ruptures. (Auth. mod.)

L-50806

Russi, M., et al, **Analysis of digital waveforms recorded at the seismographic station Esperanza**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.162-166, 13 refs.

The evolution and structural properties of the Scotia region are extremely complex due to the interaction of the Antarctic and South American plates, with at least 4 other minor plates (Scotia, Sandwich, Shetland and Drake). The area is characterized by high seismicity, concentrated along the plate margins with events of magnitude greater than 7. For this reason the methods of quantitative seismology are the most appropriate. They are also economically valid for the investigation of structural characteristics of this area. The need for high-quality data recorded by broad-band seismographic stations located in the region has induced OGS (Osservatorio Geofisico Sperimentale) and IAA (Istituto Antartico Argentino) to install a 3-component broad-band station at Esperanza Station. It represents the first acquisition point of a network composed of 5 stations, to be completed in 1996 in Antarctica, Tierra del Fuego, and the islands distributed along the margins of the region under study. The project is included in the Programma Nazionale di Ricerche in Antartide activities. For the construction of the complete network, cooperation will be extended to the British Antarctic Survey and to the scientific institutions of other countries which are interested in the study of the region. (Auth. mod.)

L-50807

Gambino, S., Privitera, E., **Characterization of earthquakes**

recorded by Mt. Melbourne Volcano seismic network (northern Victoria Land, Antarctica), *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.167-172, 17 refs.

A seismic network consisting of 4 permanent digital stations was installed on Mt. Melbourne Volcano (2732 m a.s.l.) at the beginning of 1990. A mobile array made up of 4 digital seismic stations was also operated in the same area for a few days during the 1990-91 antarctic summer. The network station located at higher elevation on the volcano slopes detected the most interesting seismic signals, showing waveforms and related spectra typical of volcanic earthquakes (long period events). About 80 regional tectonic shocks that seemed to be located within a radius of about 150 km from Mt. Melbourne were also recorded in a 12 months recording period. Analyses of particle motion and polarization parameters of events were performed in order to characterize these events. Results obtained in a limited number of the highest energy regional and local events are reported. The location of two events where sufficient arrival times were available conforms well with the particle motion results. The study also estimates the source parameters for a single regional event the location of which was determined. (Auth. mod.)

L-50808

Gubellini, A., et al, **Italian geodetic network in Antarctica**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.173-177, 7 refs.

A geodetic network was established in the Mount Melbourne area during the fourth Italian expedition in 1988-89. Partial to complete surveys of the network and GPS measurements between Antarctica and adjoining continents had been performed during the four previous campaigns. The results of these measurements are presented, together with the results of Doppler measurements carried out on the Terra Nova Bay reference station. (Auth.)

L-50809

Bozzo, E., et al, **Technical procedures for aeromagnetic surveys in Antarctica during the Italian expeditions (1989-1992)**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.178-180, 12 refs.

The first experiments of aeromagnetic measurements carried out during the Italian expeditions in Antarctica were made in 1989-90. Some geomagnetic profiles (using a helicopter as a measuring platform) were accomplished with proton precession magnetometers (PPM) over the suture between the Dessent Unit and the Bowers Terrane in northern Victoria Land. During the 1991-92 expedition, in cooperation with BGR (Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover), the GITARA (German ITALian Aeromagnetic Research in Antarctica) program, as part of the LIRA project (Lithospheric Investigations in the Ross Sea Area), was carried out. Research methods and instruments used are described.

L-50810

Meloni, A., et al, **Geomagnetic observatory at Terra Nova Bay Base**, *Terra Antartica*, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.181-183, 7 refs.

A geomagnetic observatory was installed at the Terra Nova Bay Station during the 1986-87 summer. Absolute measurements of the total intensity, F and the angular elements D (declination) and I (inclination) that are useful to ensure that the drift of any kind (i.e.: thermal and clinographic) in the recording instruments is corrected, were taken regularly at Terra Nova Bay. The instruments used during the last antarctic surveys include proton precession magnetometers for total intensity F recordings; DI magnetometers for absolute measuring of the angular elements D and I, and a recording system composed of three fluxgate magnetometers for H, D and Z time variation digital data acquisition.

L-50811

Bozzo, E., et al, **Geomagnetic observation results 1990-91, Terra Nova Bay-Antarctica, Terra Antartica**, 1994, 1(1), Meeting, Earth Sciences in Antarctica, 4th, Siena 1993. Proceedings. Geomagnetic Observatory results 1990-91. News from the International Cooperative Programmes, p.185-217, 7 refs.

This report deals with activities undertaken at the Italian Geomagnetic Observatory at Terra Nova Bay Station during the austral summer 1990-91. Beginning and ending dates of the activities described in this report are the following: total intensity F recordings, from Nov. 13, 1990 to Feb. 15, 1991; H, D, Z element recordings, from Nov. 13, 1990 to Feb. 13, 1991; absolute measurements (DI), from Nov. 16, 1990 to Feb. 13, 1991.

L-51264

Bozzo, E., Colla, A., Chiappini, M., Caneva, G., **Aeromagnetic survey "GITARA III"**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.26-31.

The German aeromagnetic surveys carried out during the GANOVEX IV-V-VI expeditions, between 1984-1990, supplied important information on the structure of north Victoria Land and on the RSA (Ross Sea Area), leaving broad spaces of research, especially in the continental sector, to the development of the new GITARA (German Italian Aeromagnetic Research in Antarctica) aeromagnetic programs. This aeromagnetic project began in 1991 with the GITARA I and II campaigns, followed in 1993-1994 by GITARA III described in this report.

L-51265

Pondrelli, S., Chiappini, M., Cerrone, M., **"Seismic tomography" in the Ross Sea area, Antarctica**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.32-34, 1 ref.

The aim of the project Seismic Tomography was to define the structure of the lithosphere-asthenosphere in the Ross Sea area. In 1993-94 the 9th Italian Antarctic Expedition started to record data in the Terra Nova Bay area and along the ACRUP-1 geotraverse, starting from the coast nearby (Starr Nunatak) westward to the polar plateau. In both areas different events, such as teleseisms, regional earthquakes, some ice-quakes and shots, have been recorded. Four stations were equipped with a three-component Lennartz sensor with eigenfrequency of 0.2 Hz, a RefTek digitizer with a dynamic range of 24 bits (about 144 dB), a 580 Mbyte hard disk, a GPS receiver as time lock, a 12 v-100Ah battery and a 70 watt solar panel. The digitizer and the hard disk were located in a thermally insulated box.

L-51268

Coren, F., Lodolo, E., **Reconstruction of the oceanic crust age between Australian antarctic ridge and Ross Sea slope**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.42-43.

Three geophysical cruises were made in the past years in order to acquire seismic, bathymetric, gradiometric, and gravity profiles for a total amount of more than 6,200 km in the vicinity of the Maquarie Triple Junction (MTJ). The data analysis, and in particular the magnetic profiles, allowed the authors to reconstruct the Neogene evolution of the MTJ area (north of Balleny Is., southwest Pacific) in a preliminary way, although large sectors still remain unknown from a geophysical point of view.

L-51278

Romeo, G., Palangio, P., Cerrone, M., Morelli, A., **Technical improvements of the very-broadband seismographic station at Terra Nova Bay**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.71-74, 2 refs.

The construction of the Terra Nova Bay seismic station started in 1989, when the site of the station was drilled in a compact granite rock, using 400 kg of explosive. The drilling work was done with several low power explosions in order to avoid fracturing the rock, obtaining a 8 m deep tunnel with a platform for sensor installation at the end. The sensors were placed over the rock using a concrete interface. The nucleus of the

station heart is a Streckeisen vbb set, connected to a Quanterra acquisition system. The problems of low temperature effects on equipment found during the 1993-1994 expedition, and their solutions, are described.

L-51279

Russi, M., **New permanent broad-band seismological observatory at Base Esperanza, Antarctic Peninsula. Jan.-Feb. 1994 site survey**, Italian Antarctic Research Programme. Earth Sciences. IX ItaliAntartide Expedition, 1993-94: field data reports, [Rome, 1994], p.75-78.

It is proposed that the solution of the Scotia Sea region geological puzzle can be found only in the interpretation of data collected using different geophysical methods; seismology might play a very important role if an adequate seismological database will be available to scientists. This scientific premise gave rise to the idea of developing a broad-band digital network formed of five seismographic stations, distributed along the continental margins of the Scotia Sea region. The sites where the instruments will be installed are located on the antarctic continent (Esperanza), Tierra del Fuego (Ushuaia), and on the islands along the margins of the Scotia Sea (South Georgia Is., South Orkney Is., and Sandwich Is.)

L-51366

Garcia, R.R., Boville, B.A., **"Downward control" of the mean meridional circulation and temperature distribution of the polar winter stratosphere**, *Journal of the atmospheric sciences*, Aug. 1, 1994, 51(15), p.2238-2245, 25 refs.

In this paper, a simple numerical model that includes parameterizations of both planetary and gravity wave breaking is used to explore the influence of gravity wave breaking in the mesosphere on the mean meridional circulation and temperature distribution at lower levels in the polar winter stratosphere. The results of these calculations suggest that gravity wave drag in the mesosphere can affect the state of the polar winter stratosphere down to altitudes below 30 km. The effect is most important when planetary wave driving is relatively weak: that is, during southern winter and in early northern winter. In southern winter, downwelling weakens by a factor of 2 near the stratopause and by 20% at 30 km when gravity wave drag is not included in the calculations. As a consequence, temperatures decrease considerably throughout the polar winter stratosphere (over 20 K above 40 km and as much as 8 K at 30 km, where the effect is enhanced by the long radiative relaxation timescale). The polar winter states obtained when gravity wave drag is omitted in this simple model resemble the results of simulations with some general circulation models and suggest that some of the shortcomings of the latter may be due to a deficit in mesospheric momentum deposition by small-scale gravity waves. (Auth. mod.)

L-51435

Singh, D.D., **Shear-wave velocity and attenuation structure beneath Antarctica determined from surface waves**, *Geophysical journal international*, Sep. 1994, 118(3), p.515-528, 27 refs.

Fundamental and higher mode surface waves generated by nine earthquakes, which occurred in Antarctica and its nearby regions and were recorded at Scott Base (SBA), South Pole (SPA), Novolazarevskaya (NVL) and Mirnyy (MIR) seismic stations, are used to determine the shear-wave velocity and attenuation structure beneath these regions. The Frequency-Time Analysis method is used to determine group velocities for periods ranging from 6 to 80 seconds for fundamental and higher mode Rayleigh and Love waves. Crustal thickness is found to be 41 km beneath the eastern part and 30 km beneath the western part of Antarctica. Rayleigh and Love wave group velocities show lower values in the eastern part as compared to the western part of Antarctica. A shear-wave velocity of 3.52 to 3.7 km/s is estimated in the lower part of the crust (15-41 km from the surface) beneath eastern Antarctica. Similarly, a shear-wave velocity of 3.48-3.6 km/s is estimated in the lower part of the crust (15-30 km from the surface) beneath western Antarctica. Rayleigh and Love wave group velocities are found to be lower for eastern Antarctica compared to Australia, Canada, India and other shield models of the world. (Auth. mod.)

L-51436

Petronotis, K.E., Gordon, R.G., Acton, G.D., **57 Ma Pacific plate palaeomagnetic pole determined from a skewness analysis of crossings of marine magnetic anomaly 25r**, *Geophysical journal international*, Sep. 1994, 118(3), p.529-554, 44 refs.

This paper investigates how accurately a palaeomagnetic pole can be estimated from skewness analysis of many crossings of a single magnetic anomaly on the Pacific plate. Apparent effective remanent inclinations of the sea-floor magnetization were estimated from the skewnesses of 132 useful (out of 149 total) crossings of anomaly 25r (56.5-57.8 Ma) distributed over a distance of more than 11,000 km across the Pacific plate. These estimates were inverted to obtain a best-fitting palaeomagnetic pole latitude, pole longitude, and anomalous skewness for this single reversed-polarity chron. The best-fitting model gives a pole of 78.2N, 4.8E with a 95% confidence ellipse having a 6.4 deg major semi-axis oriented 93 deg clockwise of north and a 4.1 deg minor semi-axis; anomalous skewness is 16.2 +/- 4.6 deg (95% confidence limits). Also investigated was the effect of the dependence of anomalous skewness on spreading rate by data correction using an empirical model. The pole obtained from the inversion of this alternative data set lies a statistically insignificant 0.6 deg from the pole obtained using no correction. That a pole with usefully compact confidence limits and a narrowly resolved, precisely estimated age can be so determined suggests that an accurate apparent polar wander path with a fine-age resolution can be determined for the Pacific plate by applying the same approach to the shapes of other marine magnetic anomalies. (Auth. mod.)

L-51437

Kedar, S., Watada, S., Tanimoto, T., 1989 **Macquarie Ridge earthquake: seismic moment estimation from long-period free oscillations**, *Journal of geophysical research*, Sep. 10, 1994, 99(B9), p.17,893-17,907, Refs. p.17,906-17,907.

The authors have analyzed the long-period (1000 s) part of the Earth's free oscillation spectrum of the 1989 Macquarie Ridge earthquake. This event stands out as the largest in the last decade and as the first great earthquake to have been recorded digitally on the new generation of very broadband seismic sensors around the globe. Its spectrum was modeled for five spectral peaks, ${}_0S_4$, ${}_0S_6$, ${}_0S_9$, ${}_1S_8$ and ${}_5S_3$, taking into account the effects of lateral heterogeneity, rotation and ellipticity which cause coupling within the spectral peaks (self coupling) and between different multiplets (multiplet coupling). The effects of self coupling were calculated following the formulation of Woodhouse and Gornius (1982). Multiplet coupling only weakly affected the spectral peaks that were used. A large discrepancy in phase and amplitude between the calculated spectrum and the data was observed, which suggests that the seismic moment was some 50% larger than that inferred from surface wave analysis. An error analysis was performed in order to detect inaccuracies that might have resulted in this discrepancy; centroid time, source finiteness correction, and directivity effects are likely to cause a significant bias both in the moment and phase determination. (Auth. mod.)

L-51441

Kanao, M., **Re-scaling of seismic events at Syowa Station, Antarctica, 1987-1990**, *Japanese Antarctic Research Expedition. JARE data reports*, Aug. 1994, No.200, 212p., 5 refs.

The main purpose of this report is to investigate and re-evaluate the detection capability of teleseismic events at Showa Station. The seismic events recorded at Showa have already been compiled and published by the National Institute of Polar Research as JARE data reports, the seismological bulletin of Showa Station. The author re-scaled the events which were reported on the PDE (Preliminary Determination of Epicenters) by NEIC (National Earthquake Information Center), but were not recognized as earthquakes in the JARE data reports for the 1987-1990 period.

L-51577

Hübscher, C., **Crustal structures and location of the continental margin in the Weddell Sea/Antarctica** [Krustenstrukturen und Verlauf des Kontinentalrandes im Weddell-Meer/Antarktis], *Berichte zur Polarforschung*, 1994, No.147, 233p., In German with English summary. Refs. p.215-227.

Analysis of the refraction seismic data from AWI and the former Soviet Union in the southern Weddell Sea reveals crust about 40 km thick near the Antarctic Peninsula; the crust thins to 32 km towards east. The crust is superimposed by a sediment basin with a maximum thickness of 12 km. A high-velocity layer with a p-wave velocity of nearly 5.0 km/s is included in the basin. These velocities allow an interpretation as carbonate reef or igneous rocks. Velocities higher than 7.2 km/s are determined for the lower crust, which implies magmatic intrusions and/or underplating.

Subsidence modelling shows that a sediment basin thicker than 20 km, as interpreted by other authors on the southern Weddell Sea, is very unlikely. Similarities between the velocity distribution of the upper crust in the Weddell Sea and the Falkland Plateau support Gondwana reconstructions, which place the southern Weddell Sea in juxtaposition with the Falkland Plateau. The crust in the southern Weddell Sea is of continental origin and is stretched by a factor between 1.5 and 2.9. Gondwana reconstructions which include a sinistral strike-slip movement of a few 100 km between the Ellsworth Whitmore Mountains and East Antarctica assume oceanic crust in the southern Weddell Sea. Such models cannot be supported by the results discussed above. (Auth.)

L-51585

Schiano, P., et al, **Cogenetic silica-rich and carbonate-rich melts trapped in mantle minerals in Kerguelen ultramafic xenoliths: implications for metasomatism in the oceanic upper mantle**, *Earth and planetary science letters*, May 1994, 123(1/4), p.167-178, 32 refs.

To characterize metasomatic agents for the oceanic upper mantle, a study was made of melt and fluid inclusions trapped in metasomatized peridotite nodules (anhydrous spinel lherzolites and harzburgites) from the Kerguelen Is. These xenoliths contain three types of genetically related inclusions hosted by olivine, clinopyroxene and orthopyroxene. They are silicate melt inclusions, carbonate-rich inclusions and CO₂ fluid inclusions. The inclusions are secondary in nature and form trails along fracture planes in the sheared peridotites. Heating experiments conducted on silicate melt inclusions give an estimation of the entrapment temperatures (ca. 1250 C) and indicate that there is no genetic relationship between the inclusions and their host minerals. The chemical composition of the silicate melt inclusions is characterized by normative quartz and feldspar components, and oversaturation of the melt with CO₂. Based on their daughter mineral types, their chemical composition and high volatile element contents, the silicate-carbonate melt inclusions trapped in the ultrabasic xenoliths of the Kerguelen Is. are interpreted as small amounts of a metasomatic melt phase. These melt inclusions cannot result from melting of the anhydrous peridotite assemblages in which they have been trapped. They must represent an exotic, migrating metasomatic melt phase in the oceanic lithosphere below the Kerguelen Is. (Auth. mod.)

L-51595

Wahr, J., Han, D.Z., Trupin, A., Lindqvist, V., **Secular changes in rotation and gravity: evidence of post-glacial rebound or of changes in polar ice?**, *Advances in space research*, Nov. 1993, 13(11), p.(11)257-(11)269, 35 refs.

Observed linear trends in the position of the Earth's rotation axis, in the length-of-day, and in the Earth's gravity field have often been interpreted as evidence of post-glacial rebound. These observations have been used, together with dynamical models of the rebound, to provide constraints on the Earth's viscosity profile. The authors use results from a numerical rebound model to discuss these constraints. They also discuss the possibility that some of the observed secular effects could be due to ongoing or recent changes in ice sheet volumes. For Antarctica, they conclude that the effects could easily be as large as, or larger than, the effects of post-glacial rebound. (Auth.)

See also:

C-49834 E-49725 E-49768 E-49773 E-49800 E-49869 E-49941 E-49944 E-50266 E-50267 E-50338 E-50384 E-50484 E-50487 E-50495 E-50668 E-50726 E-50731 E-50766 E-50784 E-50793 E-50796 E-50805 E-50820 E-50874 E-50906 E-50986 E-51168 E-51204 E-51227 E-51257 E-51263 E-51270 E-51305 E-51350 E-51372 E-51438 E-51652 F-49811 F-50687 F-50980 F-51273 I-49887 I-49977 I-51596 J-49560 J-51581 J-51582 J-51586 K-50276

M. POLITICAL GEOGRAPHY

M-49578

Mielke, J.E., **Antarctic environmental protection and mineral resources**, U.S. Library of Congress. *Congressional Research Service. Report for Congress*, Oct. 4, 1993, 93-876 ENR, p.93-95, 4 refs.

The definition of the mineral resource issue, and background and analysis of the primary purpose of the Antarctic Treaty, the growing complex of arrangements for regulating activities of nations in the Antarctic known as the Antarctic Treaty System, and the Protocol on Environmental Protection to the Antarctic Treaty, are presented.

M-49579

Browne, M.A., **Antarctic Treaty System and the impact of United Nations debates**, U.S. Library of Congress. *Congressional Research Service. Report for Congress*, Oct. 4, 1993, 93-876 ENR, p.96-100, 13 refs.

This chapter discusses the background of U.N. debate on the issue known as the question of Antarctica, and the extent to which U.N. considerations have had an impact on the decisions of the Antarctic Consultative Parties. The major points of the General Assembly's 1991 resolution included the following: renewal of the Assembly's request that the Consultative Parties deposit information and documents covering all aspects of Antarctica with the U.N. Secretary-General; disappointment that the Madrid Protocol on Environmental Protection was not negotiated with the full participation of the international community; support for a permanent ban on prospecting and mining in Antarctica; and a request that the Secretary-General report annually on the state of the environment in Antarctica. A number of decisions, taken by the Consultative Parties starting with their Sep. 1983 meeting to expand participation in the ATS process, make information more accessible, and increase the regulatory basis for protection of the antarctic region, are listed. The Consultative Parties have firmly maintained that they will not agree to a U.N.-imposed system and have refused to participate in any Assembly resolutions that set any constraints on the decisions they might make.

M-49759

Blay, S., Green, J., **Practicalities of domestic legislation to prohibit mining activity in Antarctica: a comment on the Australian perspective**, *Polar record*, Jan. 1994, 30(172), p.23-32, 26 refs.

After its rejection of the Minerals Convention adopted by the Antarctic Treaty Consultative Parties (ATCPs) in 1988, Australia took a major step in its domestic law by enacting the Antarctic Mining Prohibition Act of 1991 (AMPA), to reinforce its general objection to mineral resource activities in Antarctica and its commitment to the protection of the antarctic environment. With the adoption of the Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol)—which required the parties to take steps to implement its provisions, including the enactment of domestic legislation—Australia enacted the Antarctic Treaty (Environmental Protection) Act (ATEPA). The ATEPA is meant to replace AMPA once the Madrid Protocol comes into force. This paper examines the domestic legislative efforts by Australia as a leading ATCP to ban mining activity in Antarctica. Even though the discussion focuses on Australia by examining its legislation, the problems and the issues raised in the Australian context are also relevant to other ATCPs generally, and to claimants in particular. (Auth. mod.)

M-50221

Joyner, C.C., **Antarctica and the law of the sea**, Dordrecht, Martinus Nijhoff Publishers, 1992, 302p., Refs. p.278-291.

DLC KWX70.J69

This study explores the development and application of public international law to Antarctica and to the southern ocean. Specific attention is focused on the relevance for the Antarctic of several law of the sea regimes, particularly those for territorial waters, the continental shelf, the

deep seabed, the high seas, and islands. With this conceptual framework, the study undertakes appraisal of four broad policy-oriented concerns for the Antarctic: the scope of sovereignty and jurisdiction seaward; the present Antarctic Treaty regime as it relates to the evolving law of the sea; regional resource management and conservation in the southern ocean; and environmental protection and preservation of the circumpolar marine ecosystem. The analysis is presented so as to integrate theoretical approaches with the legal status of Antarctica, various responses for administering activities in the region, and innovative treaty instruments for administering future policy considerations.

M-50295

Verhoeven, J., ed, Sands, P., ed, Bruce, M., ed, **Antarctic environment and international law**, London, Graham & Trotman, 1992, 228p., Proceedings of a Symposium held in Brussels, Belgium, Oct. 1990. Refs. passim.

DLC KWX704.95

This volume contains papers on the international legal issues concerning the antarctic environment, and is the tangible product of a Symposium held in Brussels in Oct. 1990. The papers presented illustrate a range of responses and views—some expressed in short notes, others in more substantial articles related to such questions as Antarctica and global environmental policy, the crisis within the Antarctic Treaty System, the exploitation of antarctic mineral resources, the threats to control and functioning of the antarctic ecosystem, the Antarctic Treaty regime as a model for international environmental law, the 1988 Wellington Convention and how much environmental protection it provides, and the European Community and Antarctica. The text of the Oct. 1991 Protocol on Environmental Protection to the Antarctic Treaty is presented in full as an Appendix.

M-50378

Molinari, A.E., **Projection of the Antarctic Treaty System to the end of the 20th century** [Proyección del Sistema del Tratado Antártico hacia fines del siglo XX], 1993, 9p., In Spanish. Unpublished manuscript.

The theme of this paper, presented at a conference on geographic studies on Sep. 10, 1993, in Bahía Blanca, Argentina, is based on reflections inspired by the Wellington Convention of 1988, and in particular by the signing of the Protocol on Environmental Protection to the Antarctic Treaty in Madrid in 1991. Two main issues are discussed which face the signatories of the Protocol: principles vs. economics. It is argued that, although all participants are in agreement that the antarctic environment should be protected, financing such protection will be extremely expensive. In concluding, the author expresses confidence that—due to the cooperation and good will among the participating countries—the Antarctic Treaty System should continue without any major changes well into the 21st century.

M-50465

Pannatier, S., **Acquisition of consultative status under the Antarctic Treaty**, *Polar record*, Apr. 1994, 30(173), p.123-129, Ref. p.128-129.

Under the regime established by the Antarctic Treaty of 1959, decision-making remains exclusively with the limited number of states that are entitled to appoint representatives to participate in Antarctic Treaty Consultative Meetings. Whereas the 12 original signatory states have a permanent right to attend these meetings, acceding states may gain consultative status only during the time they carry out substantial scientific research in the Antarctic. This paper addresses three issues; the first relates to the problems arising out of the 'admission procedure' adopted by the original signatory states when faced with the first application of an acceding state to become an Antarctic Treaty Consultative Party, a procedure that has been applied ever since to similar cases. The second looks at the forms of scientific research activities an acceding party ought to conduct in Antarc-

tica in order to meet the requirements laid down in the Antarctic Treaty. The third deals more generally with the issue of limited participation in the Antarctic Treaty decision-making process, which has come under severe criticism from non-Consultative Parties and states that have not acceded to the Treaty. (Auth.)

M-50825

Stokke, O.S., **Symposium report: "The Antarctic Treaty System in world politics"**, *International challenges*, 1991, 11(2), p.59-66, 4 refs.

DLC GC1000.I59

Nearly thirty years after the Treaty entered into force, the Antarctic Treaty System (ATS) is still growing in membership and functional scope. This is often taken as evidence that the system is alive, vigorous, and able to cope with a changing environment. The Fridtjof Nansen Institute gathered specialists from 6 continents in Oslo, May 21-23, 1990, to discuss two challenges: the growing need for resource management in Antarctica in response to scientific, fishing, and mineral mapping activities; and the criticism voiced in the United Nations and elsewhere of the privileged position of the Consultative Parties to the Antarctic Treaty. Summarized topical issues discussed are presented.

M-50852

Rothwell, D.R., Kaye, S., **Law of the sea and the polar regions, Marine policy**, Jan.1994, 18(1), p.41-58, Numerous footnote refs.

Applying the law of the sea in the polar regions creates great difficulties. This indicates a need to reassess the traditional notions of the law of the sea. The polar regions are distinct because they increasingly have their own separate legal regimes. These issues are examined from the perspective of six bipolar law of the sea problems: polar baselines, jurisdiction, marine pollution, deep sea bed, navigation, and icebergs and islands. A determination is made as to whether the law of the sea deals adequately with the unique geographical, climatic and jurisdictional problems which arise in the polar regions and if a (*sui generis*) approach to these issues is required. (Auth. mod.)

M-50853

Hofman, R.J., **Convention for the Conservation of Antarctic Marine Living Resources**, *Marine policy*, Nov. 1993, 17(6), p.534-536.

The Convention for the Conservation of Antarctic Marine Living Resources was concluded in 1980 by the Consultative Parties to the Antarctic Treaty, and entered into force in 1982. It applies to all biota south of the Antarctic Convergence and is unique in that it was the first international agreement requiring high-seas fisheries to be managed from an ecosystem perspective. This paper describes some of the unique ecosystem-oriented provisions of the Convention, and the measures that have been taken to begin implementing those provisions by the Commission and Scientific Committee established by the Convention. (Auth.)

M-50991

Beck, P.J., **Looking at the Falkland Islands from Antarctica: the broader regional perspective**, *Polar record*, July 1994, 30(174), p.167-180, Refs. p.178-180.

A range of geographical, political, legal, economic, scientific, environmental, and other inter connections can be drawn between the Falkland Is. and Antarctica. One common element concerns the fact that both areas remain the subject of long-standing dispute between Argentina and Britain. In the past, various attempts have been made to present antarctic experience as the basis for action in the Falklands question, most notably, as part of the search for a resolution of the Anglo-Argentine impasse regarding sovereignty over the Falklands/Malvinas. A number of proposed linkages are examined, although admittedly it is easier to pose questions than to provide answers. Nevertheless, the proposals articulate the merits of viewing the Falkland Is. in a wider regional context, defined as covering the archipelago, South Georgia, the South Sandwich Is., Antarctica, and possibly South America. (Auth.)

M-51115

Cullen, R., **Antarctic minerals and conservation**, *Ecological economics*, July 1994, 10(2), p.143-155, 43 refs.

The Consultative Parties to the Antarctic Treaty agreed in Oct. 1991 on an Environmental Protocol which, if ratified, will preclude mining in Antarctica for 50 years. Moves to preclude exploitation of antarctic mineral resources are motivated by concern about possible environmental damage associated with mining. Extraction of antarctic minerals is currently unprofitable, but could become economically important in the future. Allocative efficiency, risk aversion, and inter-generational fairness criteria are employed in this paper to consider the merits of the proposed Environmental Protocol to the Antarctic Treaty. The Environmental Protocol is judged to provide an appropriate combination of environmental protection whilst maintaining the possibility of future mineral extraction. (Auth.)

M-51290

Beck, P.J., **United Nations and Antarctica 1993: continuing controversy about the UN's role in Antarctica**, *Polar record*, Oct. 1994, 30(175), p.257-264, 27 refs.

The eleventh successive annual United Nations discussion on the 'Question of Antarctica' took place at the close of 1993. In Nov. the UN First Committee, guided by two reports from the UN Secretary-General, adopted a further resolution, which was adopted in Dec. by the General Assembly as resolution A48/80. As usual, UN members, although displaying evidence of a wider international recognition of the regime's merits, proved critical of the Antarctic Treaty System. By contrast, Antarctic Treaty Parties (ATPs) remained reluctant to allow the UN the type of role in Antarctica advocated by their critics. ATPs, following the course adopted in 1985, still refused either to participate in the UN discussions or to vote. As a result, it proved impossible yet again to secure a consensus about either the 'Question of Antarctica' in general or the UN's role in Antarctica in particular. One significant advance in 1993 concerned the end of demands advanced since 1985 for South Africa's exclusion from antarctic meetings, a change prompted by the dismantlement of the apartheid regime. The 'Question of Antarctica' is scheduled to be placed on the UN agenda in 1994. (Auth.)

M-51446

Pinochet de la Barra, O., **Reminiscences of the 1959 Antarctic Treaty Conference**, *Environmental policy and law*, 1991, 21(5/6), p.205-207.

The author delivered this speech on the occasion of a reception for delegates during the 16th Consultative Meeting. It deals with the political negotiations preceding the signing of the Antarctic Treaty, and the changes in international cooperation 30 years later.

M-51550

Jaffe, D.A., Leighton, E., Tumeo, M.A., **Environmental impact on the polar regions**, *Forum for applied research and public policy*, Spring 1994, 9(1), p.65-70, 9 refs.

The polar regions present similar environmental challenges, but they differ geographically and politically. The Antarctic Treaty System sets policies for countries conducting scientific research there. The Environmental Protocol of 1991 provides for protection of the antarctic environment. The Protocol prohibits mining and incorporates tourism and other nongovernmental activities into the binding principles, which include an environmental impact statement process. Threats to the antarctic environment, such as soil and water pollution at research stations, and tourism, are discussed. (Auth. mod.)

M-51569

Elzinga, A., **Antarctic as big science**, Policy development and big science, edited by E.K. Hicks and W. van Rossum, Amsterdam, Royal Netherlands Academy of Arts and Sciences, 1991, p.15-25, 19 refs.

DLC Q124.6.P64

A major theme in this paper has been the role of science in politics, or science as a continuation of politics; it is this role which qualifies antarctic research as big science. Added to this is the transport factor and the use of high technology to maintain artificial life support systems. It is argued that an establishment based on geopolitical decisions to reduce tensions in a region is not enough in itself. Without science, the regime would be of a different nature. On the other hand, science in its own right is never

enough to motivate a mobilization of resources and effort on the scale seen in Antarctica. In order for the symbiotic relationship to function, the symbolic-instrumental role of science must be present.

M-51589

Child, J., **Antarctica: America's continuing discovery of her far south**, *Encounters*, Fall 1991, No.7, p.21-24, 49-50.

Less than a thousand km south of Tierra del Fuego and Cape Horn lies the tip of a vast, pristine, and barren (but potentially valuable) land which was totally unknown for some 300 years after the discovery of America. For many people, particularly those in the Northern Hemisphere, this is a separate and isolated continent with few links to the Americas, or indeed to any other continent. But for others, especially those living in the southern part of South America, there is a feeling of geographic and geopolitical affinity, and even possession, toward that quarter of Antarctica which faces them across the Drake Passage. As the Quincentenary of the discovery of America approaches, it seems appropriate to explore how this last "undiscovered" portion of the hemisphere is slowly but steadily being incorporated into the vision of what constitutes the Americas. (Auth.)

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Flora

See: Biogeography/Phytogeography; Botany; Bryophyta; Ecology/Floral; Paleobotany; Plankton/Phytoplankton; Pteridophyta; Spermatophyta; Thallophyta

Forecasting

See: Weather forecasting. *Also used as subordinate term under various types of ice (snow)*

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Particles

See under: Aurora

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See [also]: Permafrost

Penguins

See: Aves-Sphenisciformes

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See: Aves-Procellariiformes

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See under: Atmosphere. Also used as subordinate term under various types of ice (snow)

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Sudden warming

Sudden warming

See under: Stratosphere

Sunspots

See under: Solar activity

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See under: Geomagnetic field. See [also]: Geodetic survey; Seismic exploration; Topographic survey

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- See [also]:* Crustal studies; Mantle studies; Structural geology

Temperature

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